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ON THE TREATMENT OF THE PEDICLE AND THE URETER IN NEPHRECTOMY

BY JOHN BLAND-SUTTON, F. R. C. S., ENGLAND

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THE chief structures to be considered in the pedicle left after removal of a kidney are the renal artery; the renal vein, and the ureter; the less important constituents are small blood-vessels, lymphatics, sympathetic nerves, and connective tissue. The all important structures to be secured are the renal artery and vein; they are the biggest blood-vessels concerned in the removal of any organ, and failure to properly secure these vessels will probably cost the patient his life. The treatment of the ureter is worth some consideration, especially from the patient's point of view, and it is my object in this communication to draw attention to some inconveniences which may be avoided, if the surgeon will give some attention to this duct.

The simplest conditions under which the pedicle is ligatured are those in which the kidney is removed for serious damage, or injury to the ureter which cannot be repaired by a plastic operation, or for a renal tumour of moderate size. The organ is exposed either by an anterior (transperitoneal) incision, or through an incision in the ileo-costal space; it is shelled out of its capsule, the ureter is found, and the pelvis of the kidney should be carefully isolated with the assistance of forceps from the renal vessels. It sometimes facilitates the isolation of the renal pelvis if the ureter is clamped low down and divided between forceps; the upper end is then useful in enabling the pelvis to be enucleated from the connective tissue in which the main vessels are embedded.

When the pelvis is cleared from the vessels, the pedicle is transfixed with a double ligature of silk and tied in two halves; to make it more secure, it may be afterwards encircled and tied by a separate piece of silk. The distal end of the ureter is then tied with a piece of thin silk, and after the mucous membrane exposed on its cut surface has been wiped with an aseptic dab, it is allowed to retreat behind the peritoneum.

The great point in this method of dealing with the pedicle is to avoid including in the ligature any portion of the pelvis. In simple conditions, it is easy with a little attention to completely isolate the pelvis in this way when it is normal in size, or only moderately dilated. When the pelvis is dilated into a huge sac some modification is required, because as the pelvis dilates it spreads the vessels over its circumference, as is shown in Fig. 1. The vessels which cross over such a dilated pelvis are worth some attention; in the normal condition the renal artery on reaching the sinus of the kidney breaks up into four or five branches, which lie embedded in loose connective tissue between the calyces on their way into the cortex. When the kidney, from any cause, becomes slowly converted into a multilocular sac, known as a hydronephrosis, the cortical tissue atrophies, and the renal artery and its branches notably diminish in size. Those terminal branches which normally

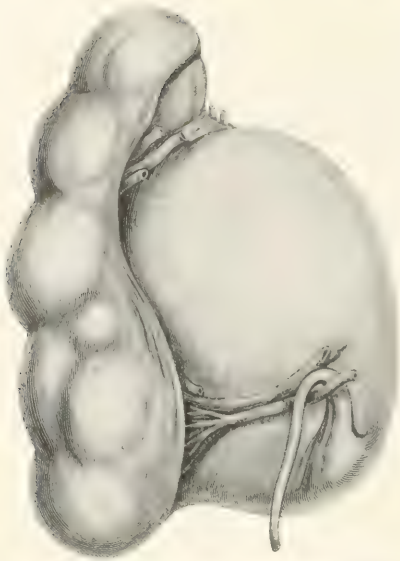

Fig. 1. A hydronephrosis shewing the way in which the renal vessels are stretched across the dilated renal pelvis. Removed by operation.

lie between the calyces become stretched and attenuated by the slowly distending pelvis until they measure as much as 10 or even 15 cm. in length. In removing a kidney of this kind, all these long vessels crossing the dilated pelvis require to be seized with hæmostatic forceps and tied separately with thin silk; in such a case there is no renal pedicle in the ordinary acceptation of the term.

It has been suggested that the ureter is occasionally obstructed by branches of the renal artery, taking an abnormal course, and the specimen represented in Fig. 1 might be supposed to illustrate this condition, for the ureter at the time I removed that hydronephrotic sac was tightly constricted by the vessel over which it bends. I am convinced that this constriction of the ureter by the vessels is the outcome of the increase in size of the pelvis distending the parts. It is quite true that no other cause can be found to account for the hydronephrosis, but this is true of all huge hydronephroses, and I have advanced arguments elsewhere to support the view that such disorganisation of the kidney is due to causes operating in antenatal life. This, however, is a digression from the main purpose of this paper.

On many occasions I have watched surgeons tying a kidney-pedicle and take no care to isolate the pelvis, but transfix it with the pedicle-needle. This not only makes an extremely thick pedicle, but it is fraught with another danger if the kidney is being removed for septic trouble, for the ligature will become septic and probably slough, or infect the veins which will in consequence become filled with septic thrombi. The kidney represented in Fig. 2 illustrates this point, for it had been explored seven years previously and a calculus removed; later it became converted into a calculous pyonephrosis and was removed; by carefully clamping the ureter and isolating the pelvis, the vessels were easily isolated and ligatured without in any way infecting the wound by leakage of septic matter from the ureter or renal pelvis.

Fig. 2. A kidney removed for calculous pyelitis and recurrent calculi. A solitary calculus had been removed from the kidney seven years previously.

There are conditions in which it is impossible to isolate the ureter and pelvis from the pedicle, especially in cases of chronic suppuration and tuberculosis of the kidney; all the surgeon is able to do, is to enucleate the kidney from its thickened capsule and then transfix and ligature the various structures in a mass, including the vessels at the sinus of the kidney, so that when the organ is detached the pedicle sticks up in the operation area like a cabbage stump. In cases of this kind a suppurating stump is inevitable, and I will briefly detail the facts of three cases which shew the inconveniences which sometimes arise.

In 1898 I removed by the transperitoneal method the left kidney of a woman 45 years of age, which, in consequence of an old standing calculous pyonephrosis, had become enlarged to the size of a big cocoa-nut; the perirenal fat had become infiltrated, and this helped to complicate matters. I succeeded in removing the kidney with its capsule and the infected fat; the stump left after the pedicle was ligatured stuck up like a cabbage stalk. A portion of the renal pelvis was included in the ligature, but I was unable to detect the ureter in the thick tissues immediately surrounding the pedicle. The wound slowly healed, and a sinus persisted for ten weeks. After the closing of the sinus, the patient began to complain of pain in the region of the stump, and pus appeared in the urine in small quantity, which, for a time, made me suspect that the right kidney might be giving trouble. Eleven months after the operation, the patient was seized with agonising pain in the left side, in a few hours the pain subsided; next morning whilst voiding urine she had a sudden pain in the urethra, and feeling something sticking out, pulled on it, and to her surprise it was the silk employed for the pedicle. The pus soon cleared up in the urine, and when I saw the patient two years later, I ascertained that she had remained free from pain.

In this instance the course of events would appear to be this: the pus around the ligature found its way down the ureter after the sinus closed, and contaminated the urine; gradually the silk separated from the pedicle, and entering the ureter, was passed downwards to the bladder with all the distressing symptoms of renal colic.

In another instance I performed nephrolithotomy on a man and removed five uric acid stones from the pelvis of his left kidney; he made an excellent recovery and returned to military duty on the North West Frontier of India. Four years later his symptoms returned, and it became necessary to remove the kidney. Nine uric acid calculi of various sizes were embedded in the cortex, and there was difficulty in securing the pedicle safely. After the operation there was a troublesome sinus for a year, and this slowly contracted to a very narrow channel, barely admitting a thin probe. When the sinus narrowed in this way, he began to complain of pain in the left loin, and to his disappointment pus and mucus appeared in the urine and made him uneasy in regard to the condition of the right kidney. I felt certain that the pedicle contained an abscess connected with the ligatures and advised the patient to have the sinus explored. This was carried out under ether, and as I surmised, the upper end of the ureter formed a small cyst which communicated with an abscess cavity the size of a thimble, containing the silks used for the pedicle. These were removed, pus disappeared from the urine, and the pain from the back; the sinus in the loin promptly closed. A year later the patient reported himself in excellent health.

The last case I wish to consider is of greater importance, because it practically ruined the life of a naval engineer. A stout, well-formed man, 38 years of age, had his kidney removed by a surgeon who had given great attention to renal surgery. The operation was performed for calculous pyonephrosis by the lumbar method, and there was great difficulty in securing the pedicle. The patient remained in hospital for several weeks and then left with a sinus; from time to time an abscess formed in connection with this sinus, and he passed the next three years of his life in and out of the hospital. Occasionally a small quantity of urine would dribble through the sinus. Eventually he came under my care, and this dribbling of urine made me suspect that some renal tissue had been left on the pedicle. I was so convinced of this that I determined to thoroughly explore the sinus down to the original stump. This was by no means an

easy matter, for the patient was a big muscular man and the sinus traversed tissues rendered tough and inelastic by chronic inflammation. However, I succeeded in tracing the sinus to a rounded piece of kidney tissue as big as the terminal segment of a thumb connected with a cyst, formed of a portion of the pelvis, which communicated freely with the ureter. This cavity, formed by the remnant of the renal pelvis, contained three facetted calculi, two of the size of cherry stones and the third a quadrilateral piece, nearly 2 cm. square and 5 cm. in thickness. These were removed with the remnant of the kidney and its miniature pelvis. I heard of the patient a year later, he was free from pain, but had become so "hospitallized" that he had taken a great dislike to work and preferred to be considered an invalid.

In order to show that removal of the kidney is a successful operation if careful attention be devoted to the pedicle, it may be worth mention that during the last seven years I have performed 58 consecutive nephrectomies with recovery. The operation was performed for the following conditions: Injury to ureter 1; tumours 10; tuberculosis 4; calculous pyonephrosis 19; recurrent calculi 3; hydronephrosis 17; suppurating hydronephrosis 1; pyonephrosis and ureteritis 3.

OBSERVATIONS UPON THE TREATMENT OF CHRONIC DISEASES OF THE STOMACH

BY B. G. A. MOYNIHAN, LEEDS, ENGLAND

DURING the last few years there has been great surgical activity in the treatment of diseases of the stomach. The number of cases upon which I have operated, and the lapse of time since the earlier cases were treated, have enabled me to draw certain conclusions which now regulate my practice in respect of the simple, that is the non-malignant, diseases of the stomach and duodenum. I think all who have had any considerable experience in the surgery of chronic maladies of the stomach will agree with me when I say that the most serious, and the most difficult problem which now confronts us is the proper selection of cases for treatment by the surgeon. It is no doubt true that in the past a number, I think only a small number, of cases have been treated by operation, which would have been better left to the continued care of the physician. Surgery may not have done harm, but it has certainly not done good; and the purpose of surgery is not a merely negative one, some positive benefit should come to reward the patient for the risk and discomfort to which he has been subjected.

It is in the discovery of the appropriate case for the surgeon that our chief work now lies. If a consecutive series of, say, 100 cases of chronic simple disease of the stomach are seen by a surgeon, he will probably be able to say of at least 95, not only what the nature of the disease is, but what is the most apt method of treatment for it; but in the remaining five the task of deciding whether there is actual organic disease or not will be almost or quite insuperable without an exploration of the abdomen. There are cases that is to say, wherein the mimicry of the clinical picture of chronic ulcer is remarkably exact. Such patients are usually women, they have suffered long, and have suffered, by their own account, such agony and so great misery, that the prospect of even the gravest operation is hailed with thankfulness, if only relief may come from it. The investigations of the physician may have convinced him that organic disease is at the root of the matter, and an urgent call for the performance of gastro-enterostomy may be conveyed from him to the surgeon. The following case is an example: —

Case 1. Miss S. F. Aged 32. Since the age of 16 she has suffered much from "indigestion." Pain comes on, generally, within a very short time of taking food, sometimes after the first mouthful has been swal-

lowed, so that occasionally she only eats a very small quantity before being compelled to get up and leave the table. At other times pain does not come on for an hour or more after food, and sometimes not for four hours. Whenever it comes it is relieved by vomiting. The pain is seated in the middle line of the abdomen on the left side of the chest, and extends up into the shoulders and the back of the neck. Flatulence is sometimes very distressing. Nine years ago she had hæmatemesis, but no great quantity of blood was lost. During the last few months the pain and vomiting have got worse, and now she vomits after every meal. When under observation in the Infirmary she vomited constantly after food, sometimes directly after taking a meal, sometimes an hour after. She has lost 3 stones in weight. The abdomen is thin: the stomach reached barely to the umbilicus on inflation. A few minutes after inflation with CO_2 the small intestine is seen to fill, and intestinal movements are visible. Test meals show no evidence of stasis, and no chemical alteration. The operation disclosed no abnormal condition. The patient after operation was better for about two weeks; then vomiting began again. The result of the operation was explained to the patient, and she was told that no visible disease was present. Her condition subsequently underwent a great improvement, and she now eats well and has regained most of her lost weight. It is interesting to remember that had gastro-enterostomy been done in this case bile would as always, have entered into the stomach. The material vomited would have contained bile and a technical fault in the anastomosis have been considered responsible. The fault would, of course, have lain, not on the method in which the operation was effected, but in the performance of the operation when no indication for it was present.

Again let me quote another case:—

Case 2. Miss M. R. Aged 33. Seen with my colleague Dr. T. Wardrop Griffith. The history was that 2½ years ago the patient began to have burning pain in the head, as though "something was running about." Later, she had pain in the body, in the epigastrium and left side. The pain was almost constantly present, but was accentuated by taking food. She felt, however, as if she could not leave off eating, though she felt very full. She constantly had a sensation of hunger. She was greatly troubled with wind; the body was distended, and she belched wind profusely. Sometimes she feels as though the stomach was working. The pain sometimes comes on at night time, and keeps her awake. She is not improved by rest, but has benefitted by restriction of the diet to fluids. Lately her symptoms have been more severe, and she has lost weight, from 8 st. 6 lbs. to 5 st. 4 lbs. There has never been any vomiting. Dr. Griffith thought that peristalsis was to be seen in the stomach, and my house surgeon agreed with him. I never saw this, though the abdominal wall was so thin, that the intestinal movements were clearly visible. At the operation nothing abnormal was discovered and the abdomen was therefore closed at once.

In both these cases I explored the abdomen, and found no evidence whatever of organic disease. The stomach was thin, the walls almost translucent, there was no ulcer, there were no adhesions, there was no displacement; the duodenum, the gall-bladder and the appendix were all quite natural in appearance. What was to be done for these patients? In looking through my cases of the last few years (Surgery, Gynecology and Obstetrics, 1907, i. 682) I have found 6 such cases and on them I performed gastro-enterostomy. Nowadays I should certainly not do so. When a stomach which shews no evidence of organic disease is discovered, there is no indication for gastro-enterostomy whatever the nature of the symptoms may have been. Even if haematemesis has been present this rule should still hold good. For, if dyspepsia of the chronic or recurrent kind is dependent for its existence upon a chronic ulcer of the stomach or the duodenum, that ulcer is a visible and a tangible thing. The ulcer that cannot be demonstrated to the entire conviction of the onlooker does not exist. No matter how urgent the recommendation for gastro-enterostomy may have been the surgeon should on no account perform it in the absence of a demonstrable need for it. It may be asked, "If the symptoms of so long a duration are not due to ulcer, what is the cause responsible for them?" To this question there is at present no satisfactory answer. The stomach in such cases is often, I think always, thin, membranous, almost translucent, as though deficient in its musculature. Yet stasis is not present, the stomach empties itself within the normal time. It may be that it empties its contents ill prepared, into an intestine whose rebellion at its improper supply is expressed in those symptoms of which the patient makes complaint. But this is mere hypothesis. The one clue, which, when followed up in these cases will lead, I think, to their discovery before operation, is the absence of an orderly arrangement of the symptoms. In all cases of chronic ulcer of the stomach or duodenum the symptoms are well-defined and are stated by the patient in terms of accuracy and precision. There may be intervals of perfect freedom from suffering, but when symptoms are present they are orderly in their appearance. In the absence

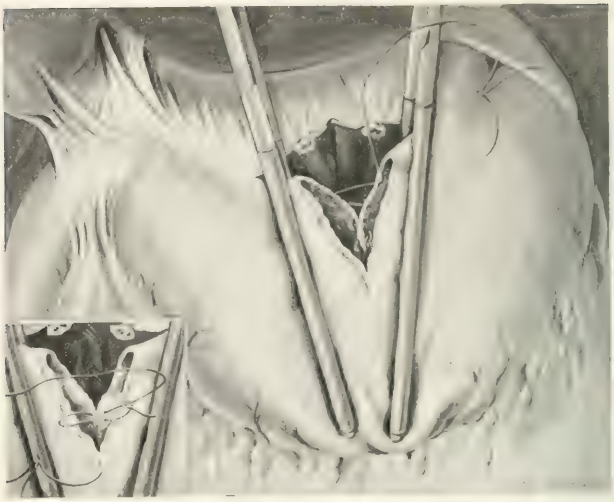

Fig. 1. Excision of an ulcer on or near the lesser curvature of the stomach. The clamps are applied to include the ulcer which is excised after separation of the gastro-hepatic omentum. In the small figure the first stitch is shewn.

of organic disease there is often a caprice in every aspect of the disease. Pain comes early or late, is now worse, now better, goes spontaneously and comes irrespective of food, solid or fluid. There is an erratic sensitiveness about the stomach. The story of one day's experience of symptoms is different from that of every other day. There is chaos where there should be order.

Another class of cases in which I have ceased to perform gastro-enterostomy is that in which the ulcer is seated on the lesser curvature close to the cardiac orifice, or within the cardiac half of the stomach. In three such cases I performed gastro-enterostomy when this condition was found. All the patients were better after the operation for a time, but this recovery was not to be compared with that easy, smooth and full return to health which would have occurred had the same ulcer been prepyloric or duodenal. One of the patients has lately relapsed, and is almost as ill as before the operation, in a second the symptoms have recurred to an extent which will probably lead me to advise the excision of the ulcer; the third case is still troubled with pain but not severely. What then is to be done for such ulcers? In my opinion they should be excised. If the ulcer be near the cardia and adherent, possibly to the pancreas, the task of excision is no light one. The technical difficulties are then far greater than in an ordinary case of partial gastrectomy for carcinoma. But excision must be practiced if at all possible, if relief is to be given. I have excised five such ulcers and the result, in all cases, has been completely satisfactory. Happily all the ulcers were solitary. If such an ulcer had been complicated by the existence of a second ulcer at the pylorus, then excision and gastro-enterostomy would both have been necessary. The technique of this operation of excision is shown in the accompanying figure.

When a chronic ulcer is seated at the pylorus along the lesser curvature close to the pylorus ("prepyloric") or, in the duodenum, gastro-enterostomy should be done. In the proper case no operation in all surgery is so completely satisfactory as this. The bad results of this operation are due, I feel sure, almost without exception to an improper selection of cases.

If the ulcer is causing obstruction, or if in its later healing it is likely so to do, then gastro-enterostomy will surely effect complete relief.

The form of gastro-enterostomy I adopt is that described in "Abdominal Operations." The no-loop operation, with clamps and two rows of suture is performed, as I there depict it. Indeed, the only question which now seems open is concerned with the direction of the jejunal application to the stomach. As I originally described it the jejunum was placed so that from the flexure it ran downwards and slightly to the right, as if it were tending towards the appendix. Dr. W. J. Mayo suggested that the anastomosis should be directed downwards and to the left, following what he described as the natural direction of the jejunum. I am not at all sure that the anatomy he describes is accurate, for the position of the jejunum as the patient lies on the operation table may not be the same as it is when the patient is erect. We find the jejunum tending from the flexure towards the upper part of the kidney merely, I think, because that is the position it must tend to assume when the patient is supine. Even then it does not always so lie, for I have found it vertical, or tending to the right in a certain number of cases. I am now investigating this point by altering the position of the abdomen, by placing a rubber cushion under the back, by turning the patient on to the right side, and so forth before the incision is made, and I propose in a few months to disclose the results. At present my opinion is that the position described by Mayo is not the best for the anastomosis to take. In deference to his opinion, than which none more strongly appeals to me, I performed a series of operations making the anastomosis along "Mayo's line," but adopting every other part of the technique of the operation as I described it in my book. I was not pleased with the results. Three of the cases suffered more from bilious vomiting than any I had seen since my early experience. My friend, Mr. Rutherford Morison says the same. He writes me: "I noted with special interest the fact that you had had vomiting after adopting the 'Mayo turn' of the jejunum. My experience was the same. In two cases, after a series of about 50 successes and with practically no vomiting, I adopted Mayo's suggestion. Both cases were more sick than of late years I have been accustomed to see." I have reverted to my original plan of the operation and now place the jejunum almost vertical with a slight, usually an extremely slight inclination to the right. My friend Dr. W. L. Rodman, who honoured me with a visit in August 1907, told me that the operation as I now practise it is the same as that I performed when he was here in 1902, except that I place the jejunum more nearly vertical now than I did then. The results of the operations so performed are quite satisfactory. The mortality now is less than 1 per cent; the after-complications are rarely encountered. Regurgitant vomiting, or the late vomiting of bile, I have certainly not met with in over 200 cases performed by the method I describe. Peptic ulcer has occurred once in a case of duodenal ulcer with intense hyperacidity. My own opinion therefore upon the question of the best form of gastro-enterostomy is in favour of the posterior no-loop method with the almost vertical application of the jejunum to the stomach. But though I firmly hold to this opinion I do not hesitate to say that many of the ill results of gastro-enterostomy, and especially that concerned with the vicious circle, are due not so much to the method practised, as to the absence of any sufficient indication for the operation itself. If the case is a proper one for gastro-enterostomy, the result may possibly be good with any one of several operations, but with the operation I describe and practise the result approaches to certainty.

In duodenal ulcer surgical treatment should always be adopted. The outlook of the patient otherwise is hazardous; the risks of perforation and lethal hæmorrhage, are far more imminent than in cases of chronic gastric ulcer. I have recently operated upon several cases where the ulcer was in an early stage; in three cases in my last 20 it was no bigger than the end of a lead pencil. I have excised one such ulcer, which had bled profusely, and I exposed a "kissing ulcer" on the posterior wall of the duodenum at an exactly opposing point. I therefore removed a part of the duodenum and closing the distal end, I mobilized the duodenum and implanted into the front of the

Fig. 2. Ulcer of the duodenum. Excision of the ulcer.

descending portion the anterior proximal end immediately beyond the pylorus. The appearance of the anastomosis did not please me, and I therefore at once performed gastro-enterostomy as well. But there are I feel sure early cases of duodenal ulcer, where the ulcer is solitary, of small size, and not causing stenosis in which this operation might with advantage be tried. If beyond the pylorus there is half an inch of healthy duodenum before the ulcer is reached, then after removal of the ulcer and closure of the distal cut end, the implantation of the proximal end, with the side of the duodenum rendered mobile by Kocher's method, would leave the action of the pyloric sphincter, unimpaired. The proximal section of the duodenum might be made in such manner that a wide anastomosis with the second portion would result. (See figure.)

I find that I have only twice performed Rodman's operation of excision of the ulcer bearing area of the stomach. I have found gastro-enterostomy to be so simple, easy and safe an operation that I have hesitated to inflict a more serious operation upon these patients. But in all cases where there is doubt as to the simple or malignant nature of the ulcer, and in some where the ulcers are multiple, Rodman's operation is imperatively indicated. I am confident that I ought to have done this operation oftener than I have done, for three cases of what at the time I supposed to be simple ulcer died eventually of malignant disease and the interval between operation and death was such that there is, to say the least, no denying the likelihood of a malignant change having occurred in an ulcer that was simple in its early stage.

If an ulcer occur in the body of the stomach causing an hour-glass condition it may be excised, or gastro-enterostomy may be done on the proximal side of it. The leaving of an undrained pyloric cavity provided the pouch be small in size, does not seem to matter. I have found gastroplasty an unsatisfactory operation on the whole. I performed it 7 times in 30 cases of hour-glass stomach, and two of these cases have needed secondary operations.

When small indurated ulcers are found in the stomach or duodenum I always infold them in exactly the same manner as if they had perforated. In doing so I make a point in my first line of suture of securing the vessels of supply. As was, I think, first shewn by Mitchell of Belfast, the infolding of an ulcer is equivalent to its excision.

Fig. 3. [illegible] after excision of the cylinder bearing the ulcer.

RADIOGRAMS OF SYPHILIS OF THE LONG BONES[1]

SYPHILITIC affections of the bones have been the last of the bone diseases to be subjected to X-ray examinations. Whereas it cannot be claimed that a pathognomonic picture can be obtained in every instance, yet a succession of these radiograms shows a uniformity in the type of the findings which correspond in a striking manner with the gross pathological findings of syphilis of the bones.

We are, therefore, justified in speaking of the "characteristic findings" which, taken in conjunction with the data of the anamnesis, materially add to the certainty of the diagnosis. Furthermore, a prognosis may be based on the radiograms, and the efficacy of treatment estimated by the regressive changes visible in successive radiograms.

As exemplifying a typical finding, mark the circumferential thickening of the periosteum in Fig. 1. It need not follow that the thickening should be circumferential and symmetrical. It may be localized (Fig. 2), and, as is apparent, to a large extent, in all radiograms. In fact, this predominance of the thickened periosteum — aside from other bone changes — stands out conspicuously in favor of syphilis of the bones, as distinguished from other chronic infections of the bone. The interpretation of this shadow is that we have to deal with a gummatous deposit. In some instances this gummatous material encroaches upon the cortex of the bone. In Fig. 3, at some levels it becomes fused with the cortex, materially contributing to the thickening of the bone (Fig. 4). At other levels (Fig. 3), it remains quite distinct. In other instances again (Fig. 6), the intensity of the shadow of the periosteum leads one to infer a deposit of lime salts in the periosteum. On the other hand, translucent areas in the periphery of the bone speak for the destruction of the gumma and bone absorption. If the subperiosteal gummatous deposit be situated in the interosseous space (Fig. 3), its diagnosis would escape detection, were it not for its exposition by a radiogram. Finally, the thickened periosteum may be lifted from the bone beneath, as is visible in Fig. 10, as a fine line.

In the bones we note an increase in their diameter. The distinctions in the shadows perceptible in a normal bone become obliterated; the corticalis appears as a denser shadow, Fig. 1, of wider extent and irregular in its outlines, often encroaching on the medulla to such an extent as to obliterate it (Figs. 6 and 10). This is due to gummatous deposit in the bone. This may be irregularly deposited, giving rise to a striated appearance of the bone (Figs. 3, 10, 11). If, as in the periostitis, this gummatous material breaks down, we have areas of more or less translucency (Fig. 3), surrounded by areas of greater bone activity (osteosclerosis),

Fig. 1. Gumma of the ulna. Circumferential shadow indicating the thickening of the periosteum. Beneath this a denser shadow, being the thickened corticalis.

Fig. 2. Gumma of the tibia. A circumscribed shadow of the thickened periosteum.

Fig. 3. Osteomyelitis gummatosa of the ulna. Ulna increased in thickness. Towards the lower end there are shadows of gummatous periostitis. About the center wall well marked translucent areas due to destructive changes of the gumma. Each area of rarefaction surrounded by a denser shadow indicative of osteosclerosis. Striated appearance of bone due to irregular ossification.

Radius on its ulnar aspect clearly shows the shadow of a periosteal thickening which could not be diagnosticated clinically. Also a bowing of the radius due to increase of growth in length (Fournier).

which appear as dense shadows. The gummatous deposit of the periosteum in the bone is attended at times by a growth in the length of bones, wherefore a bowing of these bones can be made out (Fournier). This is noticeable in the ulna of Fig. 10, and in the radius of Fig. 3.

Of great service is the use of the X-ray in aiding us to differentiate between a tuberculous and a syphilitic dactylitis. Figs. 5 and 6 strikingly portray the distinctions,— by no means always so easily to be made out. Fig. 6 shows an increase in the thickness of the basal phalanx of the index finger, traceable to some involvement of the soft parts, a greater share due to increase in the diameter of the phalanx surrounded on both sides by a thickened periosteum. In striking contrast to this is the dactylitis of tuberculosis, Fig. 5. A very large extent of the thickness is shared by the soft parts, and the metacarpus is represented by numerous cavities, some communicating, and, judging by the intensity of the shadow, the walls of these cavities and intermediate bone are rather dense. But there is a conspicuous absence of any reaction on the part of the periosteum which is encountered so constantly in all the syphilitic affections.

Fig. 4. Dactylitis syphilitica acquisita. Metacarpus of the index finger is increased in diameter. Medullary canal is encroached upon by the thickened denser shadow of the corticalis (osteosclerosis). Thickened periosteum represented by a slightly lighter shadow than that of the thickened corticalis along the inner aspect near the bone and along the outer margin near the head. Head of metacarpus translucent, due to the absorption of the bone, the picture of osteoporosis.

Fig. 5. Spina-ventosa tuberculosa. Epiphysis of the V. metacarpus has disappeared. Translucent areas [illegible] of residue of the cancellæ. Considerable involvement of the soft parts. Absence of any reaction of the periosteum encountered constantly in syphilis.

In Fig. 10, we have an instance of dactylitis of acquired syphilis, which shows the involvement of the periosteum, the denser shadows of the corticalis of the metacarpus, and a light area in the head of the bone, due to rarefaction.

These are, in substance, the findings in syphilitic affections of the long bones of acquired and late hereditary syphilis. A detailed description of the radiograms follows.

Fig. 1. Female, aged 7 years. One of two surviving children of a family of 8. Other children died within the first year. Aside from this history, there are none of the usual stigmata noticeable in hereditary syphilis. The child complained of a swelling on the forearm, another over the clavicle, and a few weeks later another node appeared over the tibia, Fig. 2.

Under antiluetic treatment they have been diminishing in size. In Fig. 1, there is a circumferential involvement of the periosteum of the ulna, which adds to the thickness of the bone, already increased in its transverse diameter, the denser shadow of the corticalis indicating bone proliferation which has encroached on the medulla.

Fig. 2 shows a circumscribed shadow of the thickened periosteum in the middle third of the tibia, indicating a gummatous deposit.

[illegible] matous of the ulna.

Mr. S., aged 42, acquired syphilis nine years ago, and notwithstanding persistent antiluetic treatment by Dr. L., with injections of the soluble and insoluble mercury salts and inunctions, he developed osseous lesions of the forearm, elbow, leg, ankle, and cranium.

Radiogram, Fig. 3. The ulna is increased in diameter. Towards its lower end there are the shadows of gummatous deposits of the periosteum. About the center there is a well-marked translucent area, due to destructive changes of the gumma. Above and below are lucid areas of lesser intensity, due to the same cause. Each of these areas of rarefaction are surrounded by denser shadows, indicating sclerotic changes of the bone. In consequence of this, the medulla is obliterated and has a striated appearance, due to irregular lines of ossification. On the ulnar aspect of the radius a periosteal thickening is perceptible, which could not be diagnosticated clinically.

Fig. 8. *Radiogram* of elbow of same. Illumination of patient from flexor surface, in partial extension.

Fig. 6. Dactylitis syphilitica hereditaria. A thickened basal phalanx of the index finger. Epiphysis not involved. Thickened corticalis is represented by a denser shadow sending spiculæ of bone into the medullary canal. The thickened periosteum shows up as a denser shadow, circumferentially surrounding the phalanx. Little involvement of the soft parts, in contrast to Fig. 5.

Articular surfaces of the radius and ulna uninvolved. Lower end of the humerus disintegrated. Structure of the condyles not discernible. Shaft of the humerus likewise devoid of structure, and an increase in the diameter due to thickening of the periosteum. Lower end of humerus presents alternately lighter and darker areas, which respectively represent osteoporotic and osteosclerotic changes. A lateral view of this same joint, Fig. 6, shows the translucent areas of gummatous destruction surrounded by denser shadows of sclerotic changes.

Radiogram, Fig. 10, and of the same patient, shows an obliteration of the medulla of the tibia, due to a thickening of the cortex. A succession of shadows giving the bone a striated appearance, due to irregular lines of ossification. Towards the lower end of the tibia a circumscribed periosteal thickening is visible.

In Fig. 11, the lower third of the tibia and fibula is pictured. Here again, we note a haziness of the inner malleolus, and passing upwards along the inner side of the tibia a thickening of the periosteum appears as a lighter shadow, overlying the denser shadow of the thickened sclerotic corticalis. The fibula about its lower third shows a circumscribed periosteal thickening and an encroachment on the medullary canal due to thickened corticalis.

Fig. 9. Clinically, no luetic history was obtainable from the parents. The child, eight years of age, was brought to the physician's notice on account of a large swelling of the forearm. This appeared more like a sarcoma, and regarded as such by another colleague, was operated upon. After incision the operation was abandoned, and a piece of tissue removed for microscopic examination. This proved the swelling to be a gumma. Antiluetic treatment from this moment on brought about a reduction of the swelling.

Radiogram, Fig. 9, shows a large light shadow to the inner side of the ulna, dependent on gummatous deposits in the soft parts. To either side of the ulna is a distinct lighter shadow, limited by the fine, dark line of the uplifted periosteum. This is a gummatous periostitis. Another such a node, casting a faint, circumscribed shadow, is also to be seen about the upper end of the ulna, on its inner aspect adjoining the radial head. Then there is the striation in the entire length of the bone, due to irregular lines of ossification, and finally the ulna is found bowed, attributed by Fournier to an increased growth in the length of the bone. A similar bowing is pictured in that of the ulna, Fig. 3.

Fig. 6. *Diagnosis* — Dactylitis syphilitica.

Clinical History. A boy, ten years of age, undersized, head prominent in frontal region, and enlarged veins; teeth very much decayed. One year previously underwent an operation for the removal of assumed tubercular glands in either submaxillary region. The cicatrices, though primarily united, are indurated, and

Fig. 7. Osteosclerosis of the humerus. (Lateral view of Fig. 8.) Shows translucent areas of gummatous destruction surrounded by denser areas of sclerotic changes. In the periphery a defect due to necrosis. The medullary canal is replaced by dense bone.

Fig. 8. Arthritis humeri luetica. Articular surfaces of the radius and ulna not involved. Lower end of the humerus disintegrated. Structure of condyles not discernible. Shaft of the humerus likewise void of structure, and an increase in the diameter due to thickening of the periosteum. Lower end of the humerus presents lighter and darker shadows which respectively signify osteoporosis and osteosclerosis.

Fig. 9. Gumma of the forearm, mistaken for sarcoma. A large light shadow to the inner side of the ulna, dependent on gummatous deposit of soft parts. To either side of the ulna is a distinct lighter shadow of gummatous periostitis, limited by a fine dark line - - the uplifted periosteum, above the upper end of the ulna on its radial aspect. In the entire length of the bone a striation due to irregular lines of ossification, and the ulna is bowed (Fournier), due to an increased growth in length of bone.

the surrounding skin has a coppery-red color. Within the past four months developed a spindle-shaped swelling, starting at the base of the basal phalanx of the index finger. The swelling is tender to the touch.

Radiogram shows a blackened basal phalanx of the index finger. The epiphysis is not involved. The shaft does not present the fine markings of the bone. The corticalis is represented by a thickened line, sending in spiculæ of bone (denser shadows) into the medullary canal. The thickened periosteum shows up as a denser shadow circumferentially surrounding the phalanx. There is little involvement of the soft parts.

Fig. 5. *Diagnosis* — Spina ventosa tuberculosa. No family, parental or collateral, history of syphilis. Within two months in this boy of five years of age a *painful* swelling appeared, involving the fifth metacarpal bone; eventually it perforated. It was very tender. Mother believes a traumatism anteceded the appearance of the swelling.

Radiogram. The epiphysis of the metacarpus has disappeared, and the shaft is represented by a series of translucent areas, bone absorption, surrounded by dense shadows indicative of bone proliferation and residue of spiculæ of the cancellæ. There is considerable involvement of the soft parts, and *an entire absence of a reaction of the periosteum, so conspicuous* in all of the foregoing syphilitic lesions.

Fig. 4. *Diagnosis* — Dactylitis syphilitica, gummatous periostitis and osteomyelitis of the second metacarpus.

History. Female, aged 28; has had this dactylitis for six months or more, and at times a node on the os frontis which disappeared spontaneously. Though married four years she has borne no children, but has

Fig. 10. Osteomyelitis syphilitica of the tibia. Cortex represented by a denser shadow, obliterating the medulla of the tibia. Striated appearance of the bone due to irregular lines of ossification. About the lower end of the tibia the shadow of a circumscribed periosteal thickening is to be seen.

Fig. 11. Osteomyelitis syphilitica of the tibia. Periostitis syphilitica of the fibula. Haziness of inner malleolus due to rarefaction of the bone. Along inner side of the tibia a light shadow (thickened periosteum), overlying the denser shadow of the thickened sclerotic corticalis. The fibula about its lower third shows a circumscribed periosteal thickening and a thickened corticalis encroaching on the medullary canal.

aborted several times. Very recently she developed a subcutaneous gumma over the patella. Up to the present moment she has never had any systematic antiluetic treatment. (See legend, Fig. 4.)

Conclusions. Osteomyelitis, of a chronic nature, dependent on pus organisms, may at times give X-ray pictures which are difficult to differentiate from those of syphilitic origin, which latter, however, are singled out by facts in the history of the case. On the whole, the productive character of the syphilitic inflammation of the bone elements manifests itself in the dense shadows of the radiograms. Gummatous deposits which cause absorption are discernible by the lighter shadows, but most commonly surrounded by the denser shadows of areas of bone consolidation. The atrophy of the bone without reactive changes (consolidation), peculiar to tuberculosis, is wanting in the radiograms. Most characteristic is the shadow cast by the periosteal involvement in syphilis of the bones.

The findings of the syphilitic bones herein described coincide with those of Hahn and Deycke, Köhler, Kienbock, Hochsinger, Ritter.

LITERATURE

Hochsinger u. Kienbock. Die Osteochondritis Epiphysiaria im Röntgenbilde. Arch. f. Dermat. u. Syph., 1901, lvii, p. 273.

Hochsinger. Studien über hereditare Syphilis. 1904.

Hahn. Congress der Deutschen Röntgen-Gesellschaft. 1906.

Hahn u. Deycke. Die Knochen-Syphilis im Röntgenbilde. Hamburg, 1906.

Köhler. Fortschritte auf d. Gebiete der Röntgenstrahlen, bd. x, h. 2.

Ritter. Zur Differential-Diagnose der Knochenverdickungen. Wiener kl. Wochenschrift, No. 6, 1907, p. 16.

Reinach. Beitr ige zur Röntgenoscopie von Knochenaffectionen hereditar-luetischer Säuglinge, bd. 45, h. i, p. 1.

A STUDY OF PSEUDOMYXOMA PERITONEI, WITH THE REPORT OF A CASE

By EDWARD A. SCHUMANN, M.D.

PSEUDOMYXOMA peritonei is the name given by Werth in 1884 to a pathological condition which sometimes arises when the fluid contents of a pseudomucinous cyst-adenoma of the ovary escape into the abdomen and there undergo secondary growth and development, with the production of large masses of thick gelatinous matter, either unorganized and lying free in the peritoneal cavity, or organized and firmly attached to parietal and visceral peritoneum.

The condition is rare, but 56 cases having been found in a rather extensive survey of the literature. As to its frequency, Baldy states he has seen 6 cases in over 6,000 abdominal sections.

Toth (1) states that in 1,700 laparotomies there were noted 4 cases of pseudomyxoma peritonei. At the Gynecean Hospital, in 2,201 abdominal sections the disease has occurred twice, and in 189 operations for ovarian cystomata there have been 2 such cases, or 1.5 per cent.

This disease seems to have attracted much attention, on the continent; many exhaustive papers having been published. In this country the reverse is true, but 4 papers bearing upon the subject being found.

That this lack of data is due, not so much to the rarity of the disease, as to its not being understood by the operator, is the opinion of Hirst (2), who recently reviewed the subject.

The clinical picture of the disease is usually fairly characteristic; a woman usually in late middle life (48 years is the average of the reported cases), who may or may not have been conscious of the presence of an ovarian tumor, notices a fairly rapid enlargement of the abdomen, accompanied by pain and by pressure symptoms, though these latter are more frequently absent. The effect upon the system is variable, cachexia developing rapidly in some cases, while in others there may be no disturbance of health whatever, though there may be enormous quantities of gelatinous pseudomucin free in the peritoneal cavity.

Upon operation there is always found a multilocular cyst-adenoma of the ovary, which has ruptured, evacuating part or the whole of its contents into the abdominal cavity. The cyst contents are usually semi-solid, gelatinous masses, of an amber color, giving the chemical reaction characteristic of pseudomucin, and often very large in amount, as much as one hundred pounds having been removed from one patient.

The peritoneum covering the viscera may be coated with a dense grayish layer of tissue, often so adherent as to make its extirpation impracticable. The appendix is frequently converted into a cyst filled with pseudomucin. The liver, spleen, and especially the intestines are commonly so involved, and the omentum is usually markedly invaded.

The prognosis in these cases is not good. The cachexia so often present, together with the fact that the pseudomucinous exudate is an excellent culture medium for the pyogenic bacteria, render immediate post-operative results most uncertain. Pfannenstiel (3) gives about 50 per cent recoveries. Gunzburger (4) reviews 45 cases with 17 recoveries, or 44 per cent. Bettman (5) in 35 cases reports 18 recoveries, or about 50 per cent. Of all the cases reported 39 recovered, 16 died, and 2 were not noted, a recovery percentage of 69.6 per cent.

Recurrence is almost universal. From the nature of the disease it is impossible to remove every vestige of the pseudomucin, and any particles remaining within the peritoneal cavity may well contain enough of the proliferating epithelial cells to cause renewed growth and secretion. Recurrence is, however, not necessarily fatal, many cases being recorded with two or more secondary operations, and ending in ultimate recovery. Pfannenstiel (3) quotes a case of Fritsch (6) in which the primary operation was performed in 1885, the second in

1886, and 11 years later, in 1897, the patient at this time 66 years of age, was again subjected to laparotomy and relieved of forty pounds of pseudomucin, a cure resulting. The case here reported has had a marked recurrence within two years, and at this date, two months after the second operation, the fluid seems to be again accumulating. The case in detail is as follows:

S. A. W., age 53, a nulliparous widow, was admitted to the Gynecean Hospital, November 14, 1904, on the service of Dr. Baldy, to whom I am indebted for the use of the clinical material. She had always been healthy, menstruation normal, of the 26 day type, and the menopause had supervened ten years before. Her previous medical and family history were not relevant. For four months prior to admission, the patient had noticed a growth in the abdomen, which gave rise to no definite symptoms, caused no pain, and was not accompanied by cachexia. There was a gradual, but steady increase in size, until at the time of admission the abdomen was greatly distended. Upon examination, the patient was found to be a well-nourished woman, with no evidence of organic disease save in the abdomen which was enormously distended with fluid. Vaginal examination revealed a mass on the left of the uterus and posterior to it, with a marked pouting of the vaginal vaults.

Laparotomy was performed by Dr. Baldy November 17, 1904. When the abdomen was opened, a large amount of semi-solid, gelatinous material poured out. This was removed to the extent of about two gallons.

The omentum was found to be converted into a large quadrangular plate of nodular tissue, composed of myriads of small cysts imbedded in loose connective tissue and bound together with partially organized masses of pseudomucin. The intestines were fairly normal in appearance.

The appendix was transformed into a pyriform cyst of many times the size of the normal organ. The pelvis contained a thin-walled, ruptured cyst-adenoma of the left ovary. This was removed, the abdomen flushed out with normal salt solution, and closed without drainage.

The patient made an uneventful recovery, but in January, 1907, was readmitted with a greatly distended abdomen, and laparotomy was again undertaken. The peritoneal cavity contained three gallons of the characteristic gelatinous tissue, which was densely adherent to all the abdominal viscera and the parietal peritoneum. In many areas distinct organization had taken place, grayish, vascular and nodular masses being intimately related to the surfaces of the intestines, liver, and spleen. These masses bled so profusely on attempting their extirpation, that this was abandoned, and the abdomen again closed without drainage.

The patient convalesced rapidly, but now, four months after the second operation, the abdomen is again filling up, and there is distinct evidence of cachexia.

Pseudomyxoma peritonei. Cells originally lining an [illegible] and other viscera when they proliferate and divide, forming groups which are distinctly carcinomatous in character.

The specimen obtained from the first operation consists of two plates of omentum, the appendix, and the remains of the ruptured ovarian cyst.

The omental plates were roughly rectangular in shape, the large one measuring 20 by 15 cm., with a thickness of 3 cm., the other somewhat smaller. The tissue is nodular, the nodules consisting of dense, translucent, gelatinous material and an occasional large nodule encysted within a fairly firm, fibrous capsule. The material is pinkish yellow in color, is extremely friable, and is poorly supplied with blood vessels.

Upon section it shows the same general characteristics, with a loose connective-tissue framework, and an occasional large venous sinus running through it.

The ovarian cyst is a mass of tissue, torn and of undeterminable relations, somewhat resembling a placenta. The surface is covered with large and distorted venous surfaces. The tube can be made out as a cord extending 2 cm. beyond one edge of the shredded mass of tissue. The cyst wall cannot be separated from the broad ligament remains. What is apparently the inner surface of the cyst has some remains of gelatinous structures adhering to it in various sized areas.

The appendix is normal at its insertion into the cecum, but at the proximal one-fifth expands into a cylindrical cystic mass. The distal end of the organ is embedded in a mass of the same fibro-gelatinous tissue described above. The surface of the organ is smooth, showing no blood vessels or adhesions. It is thinned out and somewhat translucent. Upon section the appendix has been transformed into a thin-walled cyst containing gelatinous material.

At the second operation there were obtained a few small nodules of grayish tissue, which were removed from the intestinal surface with some difficulty.

Microscopically the ovarian cyst is a true pseudomucinous cyst-adenoma, glandulare. The lining membrane can be indefinitely made out with its tall cylindrical cells. The omental plates show a connective-tissue framework, fairly rich in small round cells and blood vessels. Between the trabeculæ of connective tissue, there is packed thick, amorphous, structureless pseudomucin, with many small cystomatæ. The cysts contain from one to many cylindrical epithelial cells, similar to those lining the parent cyst. In some instances one cell seems to have secreted sufficient pseudomucin to form a minute cyst, the cell itself forming a central nucleus for the cyst. In others the cells are multiple and have arranged themselves in a single layer, lining the cyst wall.

In a few places complete cysts are found, their lining membrane exactly comparable to that of the ovarian cyst-adenoma.

The specimens removed at the secondary operation do not materially differ from those first obtained, but they are richer in the epithelial cells, which seem to have proliferated to a great degree. The connective-tissue framework, the secondary cysts of various stages of completion, and the amorphous pseudomucin are indentical.

Naturally the chief interest in this condition centers about its pathology and histogenesis. If the reported cases be analyzed, it is found that they may be divided into two great groups — those in which the extravasated cyst contents remained passive in the peritoneal cavity, undergoing no change, but causing a secondary low grade peritonitis, due to the irritation of the foreign substances with the gradual overgrowth of connective tissue and organization of the pseudomucin. This, together with the edema of the peritoneum, caused by the attempt to resorb the thick tenacious matter, gave rise to the term foreign body peritonitis, so steadily used by certain of the observers.

The other group includes those cases in which living active cells of the lining cyst membrane, having been thrown into the peritoneal cavity, have found lodgment and by proliferation formed secondary cystoma, densely adherent to their nutrient base, and continually growing in size and numbers. This differentiation of the process involved led the earlier writers into marked difference of opinion, but in the light of the reported cases all the variation would seem to be part of the same cycle of development. It is easily conceivable that in one group of cases no active epithelial cells escaped at the time of rupture of the cyst, or subsequently, with the natural result that the escaped pseudomucin acted only as a foreign body.

In another group many ovarian cells may have been scattered broadcast throughout the greater peritoneal cavity and given rise to distinct foci of implantation metastases with rapid growth, and showing a morbid anatomy entirely distinct from the first group of cases. Prior to 1884 the disease was not understood at all. The diagnosis was usually colloid cancer or myxomatous degeneration of the peritoneum, a term invented by Virchow (7). The first microscopical examination of the specimens from a case of pseudomyxoma peritonei was made by Menning (8), who concluded that the condition was one of secondary myxomatous degeneration of the peritoneum, caused by the irritation of the cyst contents, thus following Virchow's idea. This view was held until Werth (9) brought out his paper, in which he proved that the disease was not a specific affection of the peritoneum, but the organization of cyst contents, free in the abdominal cavity, which caused a purely reactive inflammation of the peritoneum itself.

Shortly after Werth's studies Baumgarten (10) reported a case in which he showed that following the rupture of a multilocular cyst-adenoma, with the escape of active cells of the lining epithelium of the cyst into the peritoneal cavity, implantation metastases might develop in any situation where the ovarian cells could attach themselves and receive sufficient vascularization to grow and proliferate. This process gives rise to the many secondary cysts which are so characteristic in many cases.

Recently Fränkel (11) has shown that the old view, held by Virchow, that there occurred true myxomatous degeneration of the peritoneum, had foundation, in fact, reported a case in which this change in the peritoneum did

occur, but it must be noted that in Fränkel's case there was not a ruptured cyst-adenoma associated with the peritoneal change, so that it can hardly be considered as being a variation of the typical pseudomyxomatous degeneration.

Netzel (12) has described a condition which he terms, with Fränkel, myxomatous degeneration of the peritoneum, and which he found in a case showing the other changes of the usual pseudomyxoma peritonei, following the rupture of a thin-walled cyst-adenoma of the ovary.

Pfannenstiel (3), however, points out that Netzel's case was probably one in which an attempt on the part of the peritoneum to absorb the pseudomucin was followed by the choking of the lymph spaces by the gelatinous material, with their subsequent distention, the whole resulting in an edema of the peritoneum, having the appearance of a true myxomatous change.

The older writers almost universally classified cases of pseudomyxoma peritonei as colloid carcinoma, and if the tissue changes in these cases be analytically studied, there is found sufficient basis for this belief. For example, in the above detailed case it is found that the cellular elements lining an ovarian cyst have mechanically been scattered throughout the peritoneal cavity. There they have continued to live. In atypical surroundings they have proliferated, have penetrated connective tissues, and have formed secondary growths exactly comparable to the one in which they were developed. In addition, clinical experience has proven, that though the source of these cells be removed, they continue to grow and produce metastases. Applying the ordinary principles of cancer formation to these facts, it is readily seen that they comply with all the conditions, and the conclusion must therefore be reached that at least those cases, in which the ovarian cyst-cells continue to grow and form secondary cysts after their escape into the abdomen, must be considered as belonging to the carcinoma group, particularly the so-called colloid cancer.

From the foregoing study of this subject the following conclusions may be drawn:

1. The foreign body peritonitis of certain observers, pseudomyxoma peritonei, and secondary myxoma of the peritoneum are different stages or phases of one and the same condition.

2. That the disease depends per se upon the presence of a ruptured multilocular cyst-adenoma of the ovary.

3. That it is a dangerous disease, both as to immediate post-operative results, and also by reason of its tendency to recurrence and to the development of cachexia.

4. That inasmuch as it histologically corresponds accurately with the processes of cancer formation, pseudomyxoma peritonei must be regarded as a form of carcinoma.

The following is a brief of the reported cases:

1. Lapthorn Smith (13). Age of patient not noted. Tumor noticed two months before, large as a six month's pregnancy. Laparotomy revealed a ruptured cyst-adenoma glandulare of the left ovary. The abdomen contained two gallons of gelatinous tissue. The intestines were dull, but not roughened, and were covered with areas resembling fatty degeneration. Recovery.

2. Bettmann (5). H. W. A woman 65 years of age. Ruptured cyst-adenoma of right ovary. The abdomen was filled with gelatinous matter, adherent to the viscera. Death from sepsis.

3. Uspensky (14). A 2 para of 50 years. Tumor noted in abdomen for two years. On operation there was found a ruptured, right-sided, multilocular cyst-adenoma of the ovary. The abdomen was filled with colloid material, with marked invasion of the omentum. Death from sepsis.

4. Geyl (15). A widow of 76 years. Tumor of one year's growth, abdomen filled with topaz-colored, jelly-like material. Large thin-walled, ruptured, multilocular cyst-adenoma of the left ovary. A dirty gray deposit was attached to all abdominal organs and could not be removed. Patient died after six months.

5. Runge (16). A woman, 40 years old, had noticed an abdominal tumor growing for five months. On operation there was found a ruptured right-sided ovarian cyst-adenoma. The omentum and bladder walls were filled with small cysts. A large amount of gelatinous tissue was removed from the abdomen. Recovery.

6. Case 2d. Age not stated. A large, ruptured, multilocular ovarian cyst, with a large amount of gelatinous fluid in the peritoneal cavity. No secondary cysts. Complete recovery, without recurrence.

7. Korn (17). A nulliparous woman of 48 years. Five years previously she had a left-sided ovarian cyst removed. At present operation a large, ruptured, right-sided cyst-adenoma. The peritoneum was much injected and filled with masses of gelatinous matter. Recovery.

8. von Swiecicki (18). A woman, 54 years old, 1 para. The tumor was of six months' growth. On

operation a large, ruptured, left-sided cyst-adenoma. The peritoneal cavity was filled with gelatinous material. There was no evidence of cyst formation, but marked ecchymosis of the peritoneum. Recovery.

9. Donat (19). A woman of 38 years, 3 para. A large ovarian cyst-adenoma, ruptured on its posterior surface. The cyst wall, peritoneum, and intestines were covered with deposits of grayish material. This showed ecchymotic areas and partly formed blood vessels. A large amount of gelatinous tissue was removed from the abdomen, but no secondary cysts were discovered. Recovery.

10. Gunzburger (4). Age not stated. A ruptured cyst-adenoma of right ovary, with a dermoid on the left side, and another small dermoid on the right. Recovery.

11. Case 2d. A woman, 40 years of age. A pseudomucinous glandular cyst of right ovary. Four months later recurrence with an enormous quantity of pseudomucin free in the abdominal cavity. Recovery.

12. Tauffer (22). A woman, 43 years of age. A thin-walled pseudomucinous ovarian cyst, ruptured. Peritoneum entirely covered with a soft adherent gelatinous mass 3–4 m.m. in thickness. Recovery.

13. Case 2d. A woman, age 51 years. Bilateral pseudomucin cysts, one ruptured, peritoneum filled with gelatinous masses. Recovery.

14. Kezmarsky (20). A woman, 35 years of age. Large multilocular ovarian cyst, with thin walls, but no apparent point of rupture. The entire peritoneum covered with gelatinous masses, which were densely adherent to it. Peritoneum greatly congested. Recovery.

15. Reuder (21). A woman, 27 years old, noticed tumor in abdomen for 3 months, with pain. Upon operation, the pelvis was filled with small cysts, tumors all greatly inflamed and densely adherent. The abdominal cavity was filled with gelatinous material, which was removed, although the pelvic tumor could not be, by reason of hemorrhage. Recovery.

16. Tillman (23). Ovariotomy for cysts. One year later, second operation with discovery of colloid carcinoma of ovary, pelvis, omentum, and intestines. Death.

17. Westermark and Annell (24). A woman, 52 years old, 5 para. Tumor growing many years, right-sided glandular cystoma, densely adherent to surrounding structures. Masses of gelatinous tissue in peritoneal sac. Death.

18. Fränkel (11). A woman, 51 years old. Large right-sided ovarian cystoma, with jelly-like masses free in the abdominal cavity. Peritoneum and intestines covered with small cysts. Patient was operated upon four times in 3 years and finally died of cachexia. On autopsy, all organs were densely coated with grayish gelatinous material.

19. Gottschalk (26). Right ovary cystic, left ovary, tube, and peritoneum thickly covered with masses of pseudomucin. Recovery.

20. MacDonald (27). A woman, 44 years of age. Six months' growth. Ruptured right ovarian cyst. Peritoneum filled with gelatinous material, 20 pounds being removed. Recovery.

21. Case 2d. A woman, 58 years old. Tumor noticed one year. Right ruptured multilocular cyst. Peritoneum filled with jelly. In relation to intestines on right side, a dense cyst. Recovery.

22. Ratschensky (28). A woman, 60 years of age, noticed a tumor for 8 years. Upon operation, double ruptured multilocular ovarian cyst was found. Abdomen was full of jelly. Death.

23. Kretschmar (29). A woman, aged 52 years. Tumor noticed for two weeks. Abdomen filled with fluid. Appendix thickened. Right ovarian glandular cyst, ruptured. Death from sepsis.

24. Case 2d. A woman, 59 years of age, noticed tumor for six weeks. Right ovarian cyst, ruptured. Abdomen filled with jelly. Recovery.

25. Case 3d. A woman, 45 years of age. Double ovarian cysts, ruptured. Abdomen full of jelly. Peritoneum much injected and thickened. Recovery.

26. Beinlich (30). A woman, 54 years old. Growth of long duration. Upon laparotomy masses of thick jelly-like fluid, weighing 25 pounds, escaped. The cyst sprung from the right ovary. Drainage, death in 3 days.

27. Case 2d. A woman of 26 years, 2 para, had noticed during her second pregnancy much pain in abdomen, which continued after delivery and culminated in the discovery of a large vague abdominal tumor. On section, an ovarian cyst was found together with 30 pounds of jelly-like tissue scattered throughout the abdomen. Death resulted from shock.

28. Polano (31). A woman, 66 years of age. Left ovarian cyst-adenoma pseudomucin, large masses of pseudomucin free in the abdominal cavity. Two years later cyst developed in right ovary, ruptured. On section, abdomen filled with jelly-like mass. Small nodules densely adherent to intestines. Death from ileus. The epithelial cell had invaded the capsule of Glisson and had formed small metastatic cysts within the liver parenchyma, closely simulating cancer.

29. Mond (32). A woman, 50 years of age, with large tumor in abdomen. On section a myoma of the uterus was found, a large ruptured cyst-adenoma of the ovary, and the abdomen filled with gelatinous fluid which was removed and weighed 14 pounds. Death.

30. Lewitzky (25). Large multilocular cyst of right ovary, with spontaneous rupture. On section a bloody, gelatinous fluid was found in abdomen. Peritoneum thickened, hemorrhagic, and covered with small cysts filled with colloid tissue. The omentum covered with colloid cysts. Recovery.

31. Case 2d. Age of woman not noted. Abdomen filled with pseudomucin which sprung from a ruptured ovarian cyst, which was twisted two and one-half times on its pedicle. There were many small cysts scattered throughout the abdomen, and the omentum was greatly enlarged and contained many small cysts.

32. Brakesch (33). A woman, 62 years of age. Tumor noted three months. Upon operation, a left-sided, thin-walled, ruptured cyst-adenoma of the ovary. Abdomen was filled with greenish colloid material. Recovery.

33. Menning (8). A 46-year-old woman, who had borne nine children, had for several years noticed a swelling of the abdomen with marked menorrhagia. Upon section there was found a thin-walled, ruptured ovarian cyst, the peritoneal cavity being filled with jelly-like fluid which was firmly attached to the intestines and the other abdominal viscera. Ovariotomy, and death from shock.

34. Werth (9). Woman, 37 years old, 2 para, for some years had attacks of abdominal pain, for seven weeks marked enlargement of the abdomen. On section there was found a fist-sized pseudomucinous cyst of the ovary, without apparent rupture. The abdomen was filled with pseudomucin, partly free and partly attached to the viscera. The omentum was much injected and densely adherent to tumor. Convalescence uneventful, but sudden death three months later from pulmonary embolus.

35. Netzel (12). A spinster of 44 had noticed for one year a rapidly growing abdominal tumor, with pain and discomfort. Laparotomy was performed, with the removal of large quantities of gelatinous matter, a cure resulting. No mention is made in this case of finding of an ovarian cyst.

36. Neubauer (34). A woman of 46 years of age, 13 para. Swelling in abdomen of long duration. On section, abdomen filled with yellow, gelatinous fluid and a right ovarian cyst of adult-head size. Intestines and omentum infiltrated with pseudomucin. Recovery.

37. Strassmann (35). A woman of 28 years, 2 para. Tumor in abdomen for 8 months, last few months of very rapid growth. On section there was found a huge ruptured ovarian cyst from which poured pseudomucin and dermoid matter, hair, teeth, etc. The tumor could not be entirely removed, and the sac was accordingly attached to the abdominal wall. Death in six days. Upon autopsy there was found another pseudomucinous cyst on the cul-de-sac of Douglas.

38. Olshausen (36). A 40-year-old woman, 3 para. Patient had previously had one ovarian cyst removed. Two years later the abdomen began to swell, and on section there was found a left-sided ovarian cyst with a large amount of pseudomucin lying free in the abdominal cavity. Recovery.

39. Hofmeier (37). Age not given. A ruptured, pseudomucinous ovarian cyst was removed with large masses of gelatinous material free in the abdominal cavity. Recovery.

40. Reh (38). A 62-year-old woman, 9 para. Bilateral ovarian cysts, with pseudomucin free in the abdomen. One cyst removed, the other left by reason of adhesion to bowel. One year later, herniotomy with removal of the other cyst and large amount of pseudomucin. Recovery.

41. Case 2d. A 59-year-old woman, 3 para, with a rapidly growing abdominal tumor. On section, a large left multilocular ovarian cyst, with a smaller cyst on the right side. Abdomen filled with gelatinous matter, lying closely enfolded between the folds of intestines. Recovery.

42. Goette (39). A parous woman of 33 years. Upon laparotomy a right-sided, ruptured ovarian cyst was removed. Large masses of pseudomucin were scattered throughout the abdomen and were densely adherent to the intestines and to the parietal peritoneum which was 5 m.m. in thickness. Recovery.

43. Case 2d. A 75-year-old woman, 2 para, with an abdominal growth of one year's duration. On section there was found a large, ruptured left-sided ovarian cyst, with quantities of gelatinous matter free in the abdomen and adherent to the intestines, parietal peritoneum, and omentum which was greatly thickened. Recovery.

44. Hirst (2). A nulliparous woman of 50 years had noticed some abdominal enlargement for six months, together with complete prolapse of uterus and vagina. On section there was found 15 pounds of pseudomucin free in the peritoneal cavity, with a semi-collapsed, ruptured, left ovarian cyst. Two daughter cysts were found in the wall of the ileum. Recovery.

45. Wendeler (40). A woman of 53 years. There was found a ruptured, right-sided ovarian cyst. The abdomen was filled with gelatinous material. Recovery.

46. Lauwers (41). A woman of 40 years was operated upon for a large, thin-walled, multilocular ovarian cyst which ruptured during pregnancy operation. Attempts were made to remove all the pseudomucin, but three months later an enormous collection of pseudomucin was removed from the peritoneal cavity. Recovery was uneventful.

47. Case 2d. A girl of 24, who had a multilocular cyst of the ovary removed, returned three months later with a large collection of pseudomucin in the peritoneal cavity. Operation was followed by death.

48. Case 3d. A woman of 71 years. Section for large, thin-walled ovarian cyst with several smaller tumors in the peritoneum. Recovery.

49. Peters (42). A woman of 28 years, 1 para, noticed a growth in abdomen for five years. Upon section there was found a bilateral multilocular ovarian cystoma, with much gelatinous matter free in the peritoneal cavity. The pseudomucin was densely adherent to the intestines, and the omentum was markedly invaded. Recovery.

50. Case 2d. A woman of 37 years, 3 para, had noticed a growth in abdomen for nine months, together with some pain. Upon section there was found a thin-walled multilocular ovarian cyst, with an area of rupture on its posterior aspect, and a small right-sided ovarian cyst. The abdomen was filled with pseudomucin. Death from embolus.

51. Case 3d. A woman of 48 years, 2 para, noticed a painful tumor in abdomen for one year. On section there was found a large amount of gelatinous fluid, free in the peritoneal cavity, a ruptured multilocular cyst of the left ovary, with the omentum and intestines markedly invaded with pseudomucin. Recovery.

52. Case 4th. Patient was a woman of 62 years, 4 para. On operation there was removed a large, ruptured, right-sided, multilocular ovarian cyst. The abdomen was filled with pseudomucin, but there was no invasion of tissue. Recovery.

53. Santlus, Theo. (43). A woman of 47, 1 para. Tumor noticed for 3 weeks. On section there was

removed a ruptured, left multilocular ovarian cyst. Abdomen was filled with pseudomyxoma which infiltrated the intestinal wall and the omentum. Death.

54. Case 2d. A 64-year-old woman, 5 para. Tumor noticed for 2 years. On section removed a left-sided multilocular ovarian cyst. Abdomen filled with jelly-like material. Numerous small cysts attached to intestines, parietal peritoneum and omentum. Recovery.

55. Case 3d. A woman of 57 years, 2 para, had noticed a swelling of the abdomen for 3 months. On section an intraligamentary, right-sided, ruptured ovarian cyst was found. The abdomen was filled with jelly-like material. Recovery.

56. Case 4th. A 63-year-old woman was operated upon for pseudomyxoma peritonei, and reoperated on one year later for recurrence. Bilateral ovarian cysts removed with a large quantity of pseudomucin. Recovery

LITERATURE

1. Toth. Cent. f. Gyn., vol. xxix, 1905, p. 540.
2. Hirst. Amer. Jour. Obst., vol. liii, 1906, p. 345.
3. Pfannenstiel. Veit's Handbuch der Gyn., vol. iii, p. 324.
4. Gunzburger. Archiv f. Gyn., vol. lix, 1899, p. 1–14.
5. Bettmann. Amer. Jour. Med. Scien., 1893, N. S. cvi, p. 444.
6. Fritsch, quoted by Pfannenstiel.
7. Virchow, quoted by Pfannenstiel.
8. Menning. Ueber myxomatose Entartung des Bauchfells bei multilocularem Cystom des Ovariums. Inaug. Diss. Kiel, 1880.
9. Werth. Archiv f. Gyn., 1884, vol. xxiv, p. 100.
10. Baumgarten. Virchow's Archiv, 1884, vol. xci, p. 1.
11. Frankel. Münch. Med. Wochenschr., 1901, vol. xlviii, p. 965.
12. Netzel. Nordiskt. Med. Archiv, 1885, vol. xvii, No. 28.
13. Smith, Lapthorn. Amer. Jour. Obst, July 1901, p. 50.
14. Uspensky. Zeitschr. f. Geburts. u. Frauenkr. Ref. Cent. f. Gyn., 1888, xii, p. 380.
15. Geyl. Archiv. f. Gyn., 1887, vol. xxxi, h. 3. Ref. Cent. f. Gyn., xii, p. 543.
16. Runge. Petersburger Med. Wochenschr., No. 51 Ref. Cent. f. Gyn., xi, 1887, p. 233.
17. Korn. Cent. f. Gyn., vol. ix, 1885, p. 817.
18. von Swiecicki. Cent. f. Gyn., vol. ix, p. 691.
19. Donat. Archiv f. Gyn., 1885, vol. xxvi, p. 478.
20. Kezmarsky. Cent. f. Gyn., 1896, vol. xx, p. 747.
21. Reuder. Cent. f. Gyn., 1896, vol. xx, p. 173.
22. Tauffer. Cent. f. Gyn., vol. xx, 1896, p. 747.
23. Tillman. Cent. f. Gyn., vol. xiv, 1890, p. 102.
24. Westermark and Annell. Cent. f. Gyn., 1890, vol. xiv, p. 450.
25. Lewitsky. Monatsschr. f. Geburts. u. Gyn., 1901, vol. xiv, p. 490.
26. Gottschalk. Archiv f. Gyn., 1902, vol. liv, p. 581.
27. McDonald. Edinburgh Med. Jour., 1885, vol. xxx, p. 1024.
28. Ratschensky. Monatsschr. f. Geburts. u. Gyn., vol. i, p. 502.
29. Kretschmar. Monatsschr. f. Geburts. u. Gyn., 1897, vol. v, p. 32.
30. Beinlich. Charité-Annalen, 1874, vol. i.
31. Polano. Monatsschr. f. Geburts. u. Gyn., 1901, vol. xiii, p. 734.
32. Mond. Monatsschr. f. Geburts. u. Gyn., 1902, vol. xv, p. 122.
33. Brakesch. Cent. f. Gyn., vol. xxix, 1905, p. 539.
34. Neubauer. Inaug. Diss. Erlangen, 1888.
35. Strassmann. Zeitsschr. f. Geburts. u. Gyn., 1891, vol. xxii, p. 308.
36. Olshausen. Zeitsschr. f. Geburts. u. Gyn., 1885, vol. xi, p. 238.
37. Hofmeier. Quoted by Goette (39).
38. Reh. Inaug. Diss. Würzburg, 1896.
39. Goette. Inaug Diss. Leipsic, 1903.
40. Wendeler. Monatsschr. f. Geburts. u. Gyn., 1896, vol. iii, p. 186.
41. Lauwers. Cent. f. Gyn., 1900, vol. xxiv, p 629.
42. Peters. Monatsschr. f. Geburts. u. Gyn., 1899, vol. x, p. 749.
43. Santlus. Inaug. Diss. Berlin, 1902.

PANCREATIC DIABETES

With Remarks upon Its Surgical Treatment

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MORE has probably been written upon the pathology and treatment of diabetes than upon any other subject in the whole range of medicine, but until recently no theory of its causation has been advanced that could reasonably be held to apply to even the majority of cases. This lack of any guiding principle on which a rational system of therapeutics could be founded has resulted in the treatment being largely confined to more or less irksome dietetic and hygienic measures which, at best, but serve to stay the progress of the disease for a time. Any explanation therefor of its etiology which can be shown to apply to the majority of cases and give promise of a more radical and lasting means of combating the disease, or, better still, of detecting the cause and treating it before the onset of the characteristic symptoms, is to be heartily welcomed. This, I hope to prove, is most satisfactorily supplied by the pancreatic theory.

From 1858, when Bernard discovered the fact that puncture of the floor of the fourth ventricle, in the neighborhood of what we now know is the vasomotor centre, produced glycosuria the nervous theory of diabetes held the field, and it was not until the classical experiments of von Mering and Minkowski on the results of the extirpation of the pancreas were published in 1889 that it was seriously challenged. These observers found that excision of the pancreas in dogs and other animals gives rise to a condition comparable in every way to diabetes as seen in man. Usually within twenty-four hours of the operation the urine is increased in quantity and contains a gradually increasing amount of sugar, which reaches a maximum of 8 to 10 per cent about the third day after the operation. Although the animals eat and drink voraciously, they rapidly lose strength and flesh, death occurring about the fourth week from inanition, even when they are not previously carried off by lung disease or complications arising from the invariable disinclination of the wound to heal. Shortly before death, and when the animals are too weak to move about, the sugar usually begins to diminish, and acetone, diacetic acid, and oxybutyric acid make their appearance in the urine. Finally in some cases the glycosuria altogether ceases. The excess of sugar in the blood and urine in puncture diabetes comes from the stored glycogen in the liver, for if the hepatic vessels are first ligatured, or the animals have been starved and exercised so that the liver glycogen is reduced to a minimum, no glycosuria results from the operation. In the diabetes produced by removal of the pancreas, on the other hand, although the glycosuria is in part dependent upon the glycogen of the liver, this is not the only source, for in starved and exercised animals extirpation of the pancreas still gives rise to glycosuria, and the amount of sugar in the urine is found to bear a constant ratio to the nitrogen excretion of about 2.8 to 1, suggesting that sugar is being formed from albumen within the body and that the total quantity so formed is being excreted unutilised, corresponding in this respect to the condition met with in severe human diabetes. That the glycosuria in these animals is dependent neither upon the injury to neighbouring structures nor upon absence of the digestive ferments of the pancreas from the intestine is shown by the fact that implantation of pancreatic tissue beneath the abdominal wall is capable of preventing the appearance of sugar in the urine so long as it retains its normal structural character.

Previous to 1889 isolated instances in which diabetes had been noticed to be associated with disease of the pancreas had been recorded from time to time, but no special importance was as a rule attached to the pancreatic lesions, and the disease was usually regarded as being dependent in such cases upon implication of the neighbouring sympathetic ganglia. Thus, as early as

1788, Cawley described in the London Medical Journal a case of diabetes with atrophy of the pancreas and numerous calculi in the ducts. Chopart published a similar case in 1821, and Bright in the Medical Association's Transactions for 1833 gave an account of a diabetic with jaundice and fatty stools, the head of whose pancreas was found post-mortem to have been converted into a hard nodular tumour firmly adherent to the duodenum. Further cases were subsequently published by other observers, but in spite of these such an authority as Cohnheim concluded that all pancreatic changes met with in diabetes were either accidental or secondary complications. When the experiments of von Mering and Minkowski demonstrated the direct relationship of the pancreas to the internal carbohydrate metabolism of the body, and its independence alike of the external secretion of the gland and of its nervous connections, fresh interest was aroused in the condition of the pancreas in diabetes and a number of observers published statistics bearing on the point. Among the earliest of these were the investigations of Windle who reported that in 139 cases of diabetes the pancreas had been found to be diseased in 74, or 53 per cent. Seegen, however, who analysed the records of 92 cases stated that a pancreatic lesion had been noticed in only 17 (19 per cent), while Frerichs found disease of the pancreas in 16 out of 44 cases of diabetes (36 per cent). Hansemann again reported a much higher percentage of pancreatic lesions, 74 per cent, in the cases of diabetes examined after death in the Berlin Pathological Institute. Bloch collected 22 cases from the records of the Vienna General Hospital and found that in 12 (55 per cent) the pancreas had been recognized as abnormal. Williamson in his work on Diabetes Mellitus, published in 1898, gives an account of 23 cases in which special attention was paid to the condition of the pancreas and states that in 15 of these (79 per cent) there was evidence of disease. These widely divergent results are no doubt to a great extent to be explained by a difference of opinion as to what is to be regarded as normal and what as pathological, and it is apparent from a study of the published records that the more carefully and systematically disease of the pancreas has been searched for in cases of diabetes the more frequently has it been found.

The use of the microscope by recent observers has considerably increased the proportion of cases in which lesions of the pancreas have been discovered in association with diabetes, and this has been particularly marked since attention was drawn to the probable relationship of the islands of Langerhans to internal carbohydrate metabolism. It is not my intention here to discuss the structure and supposed functions of these characteristic groups of cells, but those who wish for an impartial summary of the evidence for and against the contending views that are held with regard to them will find a full account in a recent work by Mr. Mayo Robson and myself on "The Pancreas, Its Surgery and Pathology," published by Saunders & Co. I may state, however, that personally I am of opinion that the balance of available evidence strongly points to their being independent structures related to the control of carbohydrate metabolism that the pancreas undoubtedly exerts. Opie, who made a histological examination of the pancreas in 19 cases of diabetes, found evidence of disease in all but 4 (i. e. in 79 per cent), and Bosanquet, who also examined a similar number microscopically, found lesions of the pancreas in 17, or 90 per cent. It is noteworthy that in 4 of Opie's cases no gross abnormality could be detected, and it was not until they were submitted to microscopical examination that the disease was discovered. Most of the published cases in which the condition of the islands of Langerhans is reported have been collected by Sauerbeck, and he found that in 117 out of 157 (74 per cent) there was some abnormality. If the quantitative changes, which as Opie and others have suggested may be of importance in the diabetes of children and in hereditary cases, are excluded there remain 98, or 62 per cent, in which qualitative changes were observed. It is therefor probable that in somewhere about three quarters of the cases of diabetes a careful examination of the pancreas will reveal evidences of disease, and it is to these that the inability of the tissues of the body to deal with carbohydrates is to be attributed.

One great stumbling block in the way of the ready acceptance of the pancreatic theory of

diabetes has been the very frequent occurrence of lesions, and often very marked lesions, of the pancreas without glycosuria, but if we accept the view that the islands of Langerhans are concerned in the elaboration of the hypothetical internal secretion and that so long as they are intact carbohydrate metabolism will not be interfered with, this difficulty is met, for experiments upon animals and observations on the human subject have shown that fibrosis of the gland, fatty degeneration, etc., may involve the secreting parenchyma to a remarkable degree and yet leave the cell-islets unaffected. A very striking example of this has recently been investigated and described by S. G. Scott. The patient was a man suffering from cancer of the head of the pancreas with occlusion of the duct and secondary atrophy and fibrosis of the body of the gland. There was no trace of sugar in the urine during life, and although post-mortem microscopical examination showed that the whole of the secreting parenchyma had been replaced by fibrous tissue, there were numerous cell-groups, having the appearance and characters of normal islands of Langerhans embedded in it.

It is obvious, I think, even from the foregoing brief and imperfect summary of the evidence bearing upon the pancreatic theory of diabetes, that disease of the pancreas is responsible for a considerable number of cases, and although we are at present unable to fix the exact proportion, it is probable that at least 75 per cent can be so explained. There are some who suggest a still higher figure, and a few who claim that all cases of diabetes are of pancreatic origin, but, while agreeing that there may be fine histological and chemical changes which we are unable to detect by the methods of investigation at present available, I think there is both clinical and experimental evidence to show that the pathology of all cases of diabetes is not the same and that some at least are to be referred to other causes. If this is so, the difficulty then arises of distinguishing clinically between the pancreatic and non-pancreatic cases. Lancereaux, in 1877, claimed that diabetes associated with disease of the pancreas was always accompanied by marked wasting (diabète maigre) and was further characterised by the brusqueness of its onset, the gravity of the symptoms, and the rapid progress of the disease, while that in which there was no marked loss of flesh (diabète gras) and that ran a longer and more benign course was due to some other cause. Although it is true that some cases of pancreatic diabetes do run a rapid course and are exceedingly grave from the first appearance of the symptoms, this, in my experience, is rather the exception than the rule. I have had the opportunity of investigating a number of cases of diabetes of undoubted pancreatic origin in which there has been no marked loss of flesh, the onset had been insidious, and the general health is good several years after the discovery of the glycosuria. It is now generally acknowledged that as a rule the character of the onset and symptoms afford no evidence on which a reliable opinion can be based as to the origin of the disease. Must we conclude therefore that it is practically impossible to distinguish these two classes of cases except in the deadhouse? I think not, for by examining the urine by a modification of the method I have described for detecting active degenerative changes in the pancreas, under the name of the "pancreatic reaction," it is possible I believe to make a correct diagnosis in the majority of cases, and so give the patient, in many instances, a much better chance of cure than if he is treated only on the old empirical lines.

The "pancreatic reaction" was first described in my Arris & Gale lecture at the Royal College of Surgeons in 1904 (Lancet, March 19, 1904). In 1906 I published an improved method (Brit. Med. Journ., May 19, 1906) by which most of the defects of the original test were overcome and the result was, to a large extent, made independent of the experience of the observer. I have now examined over 800 specimens of urine by this method and found evidence of disease of the pancreas in all cases where a positive result was obtained and it was possible to subsequently examine the condition of the gland. In cases of pancreatitis that have been operated upon it has been found that the reaction became less marked as the patient recovered, and finally disappeared with his return to health. I have never obtained a positive reaction with a normal urine, nor in any case in which it was not

probable that there was some pancreatic mischief. Felix Eichler (Berl. klin. Wochenschr., 1907, Nr. 25) has recently published some experimental work which confirms my clinical results. After satisfying himself that the urine of normal human beings, dogs, rabbits, and guineapigs gave no reaction, he produced acute pancreatitis artificially in three dogs and found that in each instance the urine then gave a characteristic "Cammidgesche Pankreas-Reaktion." It is therefore obvious that since this reaction is apparently characteristic of disease of the pancreas of a degenerative character, its application to cases of diabetes may help to solve the problem of diagnosing pancreatic from non-pancreatic cases.

Taking advantage of the fact that the reaction is due to a substance having the characters of an unfermentable pentose, the following modification has been devised and employed for examining the urine from cases of diabetes, with a view to determining whether the glycosuria is associated with active degenerative changes in the pancreas or not.

After the usual qualitative and quantitative examinations have been made a carefully filtered specimen of fresh urine is taken, and 40 c.c. mixed with 2 c.c. of strong hydrochloric acid (sp. gr. 1.16) in a flask fitted with a funnel condenser. The mixture is gently boiled on a sand bath for ten minutes, cooled in running water, and the contents of the flask made up to 40 c.c. with distilled water. The excess of acid is then neutralized by slowly adding 8 grammes of lead carbonate. After standing for a few minutes the flask is again cooled and the contents filtered through a moist, close-grained filter-paper. The filtrate is well shaken with 8 grammes of powdered tribasic lead acetate, and the resulting precipitate removed by careful filtration. The lead in solution is now removed by passing a stream of sulphuretted hydrogen through the liquid for several minutes and filtering off the precipitated lead sulphide. The resulting clear liquid is next incubated at 37° C., to drive off the greater part of the dissolved gas, and when this has been accomplished, is carefully neutralised with decinormal sodium hydrate solution. After being diluted with an equal volume of distilled water, it is mixed with a small quantity of fresh cake ("German") yeast and incubated at 37° C. to remove the fermentable sugar. At the same time a control specimen, which has been treated in exactly the same way, save that it has not been boiled with hydrochloric acid, is placed in the incubator, and from time to time samples of this are taken, filtered, and tested for sugar by Kowarsky's method (Eulenburg's Lehrbuch der Klin. Untersuchungsmethoden, bd. i, s. 80). When crystals of glucosazone can no longer be obtained, the original specimen is cooled, filtered, and 20 c.c. of the filtrate mixed with 0.8 grammes of phenylhydrazin hydrochloride and 2 grammes of powdered sodium acetate contained in a small flask, fitted with a funnel condenser. The mixture is boiled on a sand bath for ten minutes and then filtered hot, through a filter paper moistened with hot water, into a test tube provided with a 15 c.c.-mark. Should the filtrate fail to reach the mark, it is made up to 15 c.c. with hot distilled water and stirred with a glass rod. After standing for 24 hours undisturbed the test tube is examined, and in cases of pancreatic diabetes a more or less well marked deposit of crystals will be found. Under the microscope these are seen to be small fine, light yellow, flexible sheaves, which when irrigated with 33 per cent sulphuric acid melt away and disappear in 10 to 15 seconds after the acid first touches them. On being collected and purified by recrystalisation they are found to melt at about 160° C. They can be distinguished from glucosazone crystals by their appearance under the microscope, their ready solubility in 33 per cent sulphuric acid, and their melting point.

I have examined 83 specimens of urine from 48 cases of diabetes by this method and obtained a positive result, suggesting that the diabetes was probably of pancreatic origin, in 36 (75 per cent) of the patients. In 12 no reaction was obtained. Of the 12 whose urine gave no reaction two were children, and when the pancreas of one of these was examined post-mortem no abnormality could be discovered, either microscopically or macroscopically; the pancreas of the other was not examined after death. Two others in this group were also examined post-mortem and the pancreas was said to be normal. My observation of the 36 cases that gave a positive reaction has

led me to divide them into three classes. 1. Those in which there was pancreatic mischief, probably secondary to some morbid influence reaching the gland by way of the ducts. 2. Those probably secondary to blood diseases or circulatory disturbances. 3. Those in which the diabetes was induced by destruction of the pancreas by malignant disease, either primary, or a secondary invasion from neighbouring organs. I have had 19 cases belonging to the first class. In 3 of these the glycosuria followed an attack of acute or subacute pancreatitis from which the patient recovered, and 16 were due to chronic inflammation of the gland, secondary in 6 instances to the presence of gallstones in the common duct, to an ascending duodenal catarrh in 8, and associated with the presence of pancreatic calculi in 1, and with a cyst of the pancreas in 1. Seven cases were diagnosed as belonging to the second class, in 5 of these there was arterio-sclerosis, 1 was probably syphilitic, and the seventh was found post-mortem to have interacinar pancreatitis, a disease probably due to some unknown blood condition. Of the 48 cases of primary malignant disease of the pancreas that I have examined I have only met with the sugar in the urine of 2, and both of these gave the modified "pancreatic reaction". In two cases of extension of a malignant growth from a neighbouring organ (cancer of the duodenum in one, and cancer of the common bile duct in the other,) I have also found sugar in the urine and obtained a positive "pancreatic reaction". Two of these 36 cases have been examined post-mortem, in one there was well marked interacinar pancreatitis, and in the other advanced fibrosis of the pancreas with calculi in the ducts.

The satisfactory results obtained by the administration of thyroid preparations in myxoedema and cretinism have naturally suggested that extracts, or preparations, of pancreas might be equally effectual in the treatment of pancreatic diabetes. In a few cases it has been claimed that some amelioration of the symptoms has been produced in this way, and I have personally had the opportunity of investigating 2 cases where decided benefit followed the administration of an emulsion of fresh pancreas twice daily. In the majority of cases, however, no marked benefit results, and in those where some improvement occurs it is probably due rather to the effects of the pancreatic preparation on the digestion than upon any influence that it exerts upon internal carbohydrate metabolism. Subcutaneous injections have been employed, but with no satisfactory results, and the subcutaneous implantation of the pancreas of the lower animals, in the few cases where it has been tried, has proved to be equally unsatisfactory as a therapeutic measure. Basing their treatment on the effects of secretion as a stimulant of the pancreas, Moore, Edie, and Abram have made use of an acid extract of duodenal mucous membrane in diabetes. They state that in some cases a gradual diminution of the sugar has been brought about and that in a few it has finally disappeared. Other observers, however, deny that the treatment of itself produces any improvement in the symptoms and attribute the results observed to the diet and hygienic measures adopted. This method of treatment is as yet in too early a stage of trial to make any definite statements as to its real efficacy in genuine cases of pancreatic diabetes, but, even should it be eventually proved that an acid extract of intestinal mucous membrane can exert some influence in controlling glycosuria, it is questionable whether in the end it may not do more harm than good, for the artificial stimulation of the diseased pancreatic tissue, although it may at first produce increased activity, is likely in the end to bring about fatigue and more rapid degeneration than if the work of the gland had been kept at the lowest possible limit by diet and physiological rest alone. Cohnheim's work upon the effects of a mixture of pancreatic and muscle extracts on glycolysis has suggested the use of such a mixture in diabetes, but this too is as yet in an experimental stage.

Whether it will eventually be found possible to treat pancreatic diabetes successfully by one or other of the methods mentioned, or further experiment will reveal some altogether different line of treatment, it is impossible to say, but at present advanced diabetes, whatever its origin, is impossible of cure and can only be controlled along the lines that experience has indicated. It is far otherwise in the early

stages of the disease, and in what one may term the pre-glycosuric condition, when those degenerative changes in the pancreas which may eventually interfere with, and destroy, its power of controlling the metabolism of carbohydrates within the body are but commencing. So long as the etiology of many lesions of the pancreas was obscure and their diagnosis a matter of extreme difficulty, little could be done to deal with them before they had advanced to such a stage that the functions of the gland were hopelessly impaired, but now that we can readily detect the presence of degenerative changes by means of the pancreatic reaction in the urine, and a consideration of the clinical history and symptoms, together with the results of a careful examination of the urine and faeces, will usually serve to throw light on the cause of the condition, there can be no reasonable excuse for allowing the disease to progress undiagnosed and untreated until diabetes supervenes.

My object in dividing cases of pancreatic diabetes into three classes has been to make clear their etiology and so open the way for earlier and more radical treatment. In the first class, namely those in which the pancreatic mischief is secondary to some morbid influence reaching the gland by way of the ducts, there is usually a long antecedent history of "dyspepsia" or gastro-intestinal trouble, probably indicating a duodenal catarrh, or of attacks of jaundice of the "catarrhal type," or of gallstones. The progress of the disease is slow, and it is not until the pancreatic lesion has reached an advanced stage that glycosuria occurs. I have met with cases in which this was shown by several years intervening between the discovery of the pancreatitis and the appearance of sugar in the urine. One patient who was operated on by Mr. Mayo Robson twelve years ago for gallstones, did not develop glycosuria until eight and a half years afterwards. In another the symptoms of diabetes came on four years after an exploratory operation for what was believed to be cancer of the pancreas. At the time these operations were performed chronic pancreatitis and its possible consequences were not fully recognized, but had means been taken then to stay its progress it is quite likely that a cure, which is now impossible, might have been effected. The results that may follow the neglect of the warning conveyed by the presence of the pancreatic reaction in the urine are well illustrated by the following case. In May, 1904, I was asked to examine the urine of a girl who was complaining of indefinite abdominal symptoms, with loss of appetite and general ill-health. I found a positive "pancreatic reaction," a considerable excess of indican, and a rather high proportion of ethereal sulphates, and consequently diagnosed "chronic pancreatitis, probably secondary to a gastro-intestinal catarrh." It was stated, however, that there was no evidence clinically of disease of the pancreas, and, as the surgeon in charge of the case considered that the symptoms were due to appendicitis, he operated for that disease. In June, 1906, I was again asked to see the patient and found that she was much wasted and was passing 5 per cent of sugar in her urine. She still gave a well-marked "pancreatic reaction," and I diagnosed pancreatic diabetes. The patient was put on a restricted diet and treated for that condition,, but the disease was now too far advanced to hope for any very great improvement. In this case the diabetes was apparently due to disease of the pancreas secondary to a duodenal catarrh. The pancreatitis certainly existed for two years, and probably for four, before the destruction of glandular tissue had advanced sufficiently far to interfere seriously with carbohydrate metabolism.

The striking increase in the death rate from diabetes shown in recent years by the Registrar-General's returns is probably not unconnected with the greater prevalence of digestive disturbances, and I would urge that when symptoms of dyspepsia are combined with the presence of the "pancreatic reaction" in the urine prompt steps should be taken to deal with the pancreatitis that is present, lest, in the course of time, worse should befall. In addition to the routine medical treatment of such cases I make use of salicylate of soda and intestinal antiseptics, such as sulphocarbolate of soda or izal, with a view to controlling the infection of the pancreatic ducts. Physiological rest is also given to the pancreas by a carefully selected diet and by placing the meals at the longest possible intervals from each other. If, after

a fair trial, these methods are found to fail, and the "pancreatic reaction" persists as markedly as ever, recourse must be had to surgery. The pancreatic ducts must be drained by cholecyst-enterostomy, and, if necessary, a gastro-enterostomy will give rest to the inflamed duodenum.

Diabetes is not a common result of obstruction of the common duct by gallstones, but it does follow in a certain proportion of cases, and it is impossible to foretell what will result in any particular instance. I have already mentioned one case in which glycosuria developed eight and a half years after an operation at which, although the gallstones were removed, no provision was made for dealing with the pancreatitis that was present, and I have met with other similar cases in which sugar was found three or four years after an operation for gallstones in the common duct. In 65 consecutive cases where biliary calculi were found at operation in the common bile duct, and the pancreas was enlarged and hard, sugar was found in the urine of 4 (6 per cent). In 3 of these the amount was under 0.2 per cent, and in the fourth 0.4 per cent was present. All gave a characteristic "pancreatic reaction". After these patients had been operated upon by Mr. Mayo Robson, and the pancreatic and bile ducts drained through a cholecystenterostomy opening, the sugar and "pancreatic reaction" disappeared from the urine of all but the last. In this case the "pancreatic reaction" persisted, the sugar gradually increased, and ten months after the operation he died of diabetic coma. Chronic pancreatitis is found to be associated with about 70 per cent of cases of common duct cholelithiasis, and as medical treatment has little or no effect on the disease, it is important that all gallstone cases should be operated on at the earliest possible moment, particularly it there is a well-marked "pancreatic reaction" in the urine. A small amount of sugar is no bar to operative interference, in fact, as I have stated above, it may result in the disappearance of the glycosuria.

Both pancreatic calculi and cysts are probably the results of catarrhal pancreatitis, due to an infection of the ducts from the duodenum, and although no radical benefit can be expected to follow the treatment of the diabetes occasionally found to complicate these conditions, much may be done to prevent their onset and to avoid a consequent glycosuria by timely recognition of the chronic pancreatitis that precedes and accompanies them.

The treatment of cases belonging to the second and third classes calls for no special remark. The etiology of arterio-sclerosis and interacinar pancreatitis is alike obscure, and until we have further information with regard to them empirical methods of treatment are all that can be adopted. Syphilitic patients with diabetes are said to have been cured by anti-syphilitic treatment, but, as a rule, the result is not satisfactory. The arterio-sclerotic type of diabetes is the most hopeful. It is the form most commonly met with in elderly people and is probably due to circulatory disturbances in the pancreas. It is not infrequently associated with granular kidney and traces of albumen in the urine. These patients usually respond well to dietetic and general hygienic treatment, carefully applied according to the requirements of the individual case. All the 5 cases I have had the opportunity of observing have much improved under treatment. Diabetes due to destruction of the pancreas by malignant disease, either primary or secondary, is beyond all forms of satisfactory treatment.

The pancreatic theory of diabetes, as it stands at present, does not meet every difficulty or open a royal road to the cure of the disease. It makes clear, however, many points in the etiology that were formerly obscure and suggests means by which the old adage, Prevention is better than cure, may be applied to many cases of this most troublesome and fatal disease.

PANCREATIC CATARRH AND INTERSTITIAL PANCREATITIS IN THEIR RELATION TO CATARRHAL JAUNDICE AND ALSO TO GLYCOSURIA

By A. W. MAYO ROBSON, [illegible]

CATARRHAL jaundice has for ages been described clinically and is one of the best examples of a symptom giving its name to a disease.

I venture to think that the true pathology of the disease has been misunderstood, and in the greater number of cases the cause is in the pancreas and not in the bile ducts, which are simply obstructed and not necessarily inflamed.

At first sight, for a surgeon to take as his subject one which the physicians have generally considered to be purely medical from first to last, may appear unusual, but I would remind my hearers that during the past thirty years we have, as the result of observations made on the living patient during operation, frequently had to alter our views of the pathology of a disease when those views had been founded on post-mortem examination alone.

It has been hitherto generally accepted that both acute and chronic catarrhal jaundice are always due to a catarrh extending to the bile ducts from the duodenum and that the swelling of the bile channels leads to obstruction of the bile flow from the secreting part of the liver.

Dr. Hilton Fagge, however, doubted that catarrh of the bile ducts gives rise to a swelling of the mucous membrane. He says: "A more probable suggestion is that catarrh of the duodenum obstructs the oblique and narrow passage of the duct through the walls of the gut." If so, we may ask why jaundice does not more commonly follow what is probably a frequent disorder?

This may be and is possibly true sometimes, though it is difficult to prove, as the slighter cases of acute catarrhal jaundice neither cause death nor require surgical treatment.

The severer cases of catarrhal jaundice starting in the same way as acute catarrh, but ending in chronic jaundice, have however afforded many opportunities both for clinical observation and pathological investigation, and as the result of this experience I believe that while many of the ordinary cases of acute catarrhal jaundice are pancreatic in origin, nearly all or possibly all cases of so-called chronic catarrhal jaundice are due to catarrh of the pancreas or to interstitial pancreatitis.

My aim is to adduce arguments in support of these views, which were mentioned by me in my Hunterian Lectures on the Pancreas before the Royal College of Surgeons in England in 1904, and later in addresses before the Canadian Medical Association and the Royal Medical Society of Edinburgh.

When it is borne in mind that the bile ducts have only a limited calibre, that the secretion of bile takes place under very low blood tension, and the excretion of bile along the ducts has very little force behind it, and is therefore arrested by a slight obstruction, it is easy to realize how a comparatively slight pressure on the outside of the common duct will lead to arrest of the flow into the duodenum and to the absorption of the secreted bile by the lymphatics or blood vessels, thus leading to jaundice.

This obstruction may doubtless at times occur within the ducts as hitherto believed, owing to a swelling of the mucous lining of the ductus communis or of the papilla, it will then be due to a true cholangitis (I need not now refer to gall-stones or other obstruction); or it may be due to pressure on the outside of the common duct by the swelling of the head of the pancreas, which occurs in cases of catarrh of the pancreatic ducts and in interstitial pancreatitis in about two thirds of all pancreatic inflammations. The jaundice will then be of pancreatic origin. We may, therefore, speak of catarrhal jaundice as being of two varieties, cholangitic or pancreatic.

Seeing that acute catarrhal jaundice does not "per se" lead to death, post-mortem evidence can only be obtained when the disease coincides with some other local ailment

or fatal accident, and in such cases where this opportunity has arisen there has been no sign of internal obstruction of the ducts, as shown by the easy passage of a probe from the papilla and by laying open the bile passages. Neither can post-mortem evidence always be relied on to prove the pressure that may be exercised by the inflamed head of the pancreas; as after death the swelling of the head of the pancreas from engorgement may subside and only by microscopic examination or by examination during life with the abdomen open may it be possible to prove the condition of the pancreas. I had the opportunity of observing the condition in one case of jaundice on which I operated for gall-stones, in which death was due to apoplexy, occurring during anæsthesia and where a post-mortem examination of the pancreas which surrounded the common duct revealed nothing abnormal to the naked eye, but in which a careful microscopic examination shewed a small celled infiltration between the lobules of the pancreas and swelling of the secreting cells of the gland. In this case the swollen head of the pancreas was felt at operation after the presence of pancreatic inflammation had been proved by an examination of the urine and fæces.

If, however, it is difficult to prove the cause of the obstruction in acute catarrhal jaundice from lack of post-mortem evidence, there is not the smallest difficulty in demonstrating the cause in so-called chronic catarrhal jaundice, which is, I believe, practically always dependent on catarrh of the pancreas or on interstitial pancreatitis.

I had the honor, in a lecture given before the London Polyclinic in July, 1900, of drawing attention to the clinical and pathological importance of chronic inflammations of the pancreas, which diseases were up to that time considered merely as pathological rarities of no practical importance.

I then demonstrated the fact that interstitial pancreatitis might simulate in many of its symptoms cancer of the head of the pancreas, owing to pressure on the common bile duct and the consequent presence of jaundice, and that such cases, if not treated, might terminate fatally under the supposition that the disease was malignant, whereas by a recognition of the cause and efficient treatment life might be saved in a very large proportion of cases.

The lecture was based on observations extending over a period since 1890, and I was able to illustrate my subject by a large series of cases treated surgically.

Within a short period of the publication of that lecture numerous surgeons, both at home and abroad, confirmed the accuracy of these observations and reported cases successfully treated.

An extended experience of over 200 cases in which I have operated on patients suffering from chronic interstitial pancreatitis or from chronic pancreatic catarrh as clinical entities, or from those affections complicating other diseases of the duodenum or gall-bladder, has confirmed my original observations, and the subject has been established on a firm basis both with regard to pathology and treatment.

The difficulties of making an accurate diagnosis of chronic inflammatory disease of the pancreas was at first considerable, but in a lecture that I gave before the American Surgical Association in 1901, I was able to announce the fact, that while working in conjunction with Dr. P. J. Cammidge to try and find some evidences of metabolic changes in the urine of these cases, my colleague working on theories that we had previously discussed, had discovered by an elaborate chemical investigation that certain characteristic crystals could be obtained from the urine in cases of inflammatory disease of the pancreas, which were peculiar to the disease in question. The usefulness of this test has as yet not been fully appreciated in this country, though in Germany, in Russia and in some other countries reports as to the value of the method have been received. This chemical test has proved of the greatest help to me clinically, as it enables a diagnosis to be made in a very large proportion of cases even in the early stages of catarrhal inflammation.

For the details of the process I would refer my hearers to a work on the Surgery and Pathology of the Pancreas just published by Messrs. Saunders & Co., where may be found a full description of the technique employed.[1]

[1] Editor's Note.—See also The Technique of the Examination of the Urine and Fæces in Suspected Cases of Disease of the Pancreas by P. J. Cammidge, SURGERY, GYNECOLOGY AND OBSTETRICS, vol. iii, September, 1906, p. 44. Also page 22 of this issue.

Another valuable help in diagnosis may be obtained by a careful chemical analysis of the fæces, especially for fat, of which the greater part in pancreatic disease is unsaponified neutral fat.

Although in any single case we may not have all the typical symptoms and signs, yet in no case ought we to fail to find evidences of digestive, metabolic, or physical signs if chronic inflammation of the pancreas be present.

There can be, therefore, no justification for the view still entertained by some clinicians that chronic pancreatitis or even catarrh of the pancreas can be rarely recognized during life as a clinical entity, for from the information obtained by a careful physical examination of the patient, a knowledge of the history of the case and the results of a chemical and microscopical examination of the excreta a correct opinion may be proved in a large majority of cases.

It is not my intention to consider fully all the questions bearing on chronic interstitial pancreatitis in its advanced stages, but rather to show that the so-called chronic catarrhal jaundice is pancreatic in origin, that it is the first stage in the more serious disease, chronic pancreatitis, and that by timely treatment the morbid process can be arrested.

The so-called chronic catarrhal jaundice is characterized by jaundice more or less deep, coming on painlessly and associated with digestive disturbances and with great loss of flesh. If the disease has persisted for some weeks, the liver is generally swollen and readily palpated, its edges being smooth and not nodular. The gall-bladder may be enlarged if the pressure on the bile duct is great and cholelithiasis has not previously led to its contraction.

If there is intermittent pain, it is usually due to some complication such as chronic catarrhal cholecystitis or cholangitis, or to gall-stones or duodenal ulcer, both of which may cause catarrhal pancreatitis. If there are rigors they are usually dependent on associated infective cholangitis.

Besides the dark urine and the light bulky fæces there is usually intense irritation of the skin, which from repeated observations I think is much greater when jaundice is of pancreatic origin than in cases where it is dependent on obstruction higher up in the biliary passages.

On palpation, tenderness can usually be elicited on pressure about ½ to 1 inch above the umbilicus in the midline and occasionally, if the patient is thin, a transversely elongated swelling may be felt there.

An examination of the urine will usually afford a positive pancreatic reaction, and the fæces will usually show a great increase in the excretion of fat, the proportion of neutral fat to fatty acids being especially increased.

The following case out of many that I could relate affords an example demonstrating that the jaundice attributed to cholangitis was caused by the swollen and inflamed head of the pancreas pressing on the common bile duct.

A lady, aged 50, had for several years suffered from attacks of distinct biliary colic, which during the past two months had been followed by jaundice, fever, and collapse. There had recently been loss of flesh. On examining the urine, fine pancreatic crystals were discovered, and at the operation on April 30, 1903, forty gall-stones were removed from the gall-bladder and cystic duct. None were found in the common duct, though the head of the pancreas was distinctly swollen and harder than normal. The gall-bladder was drained. The patient made a good recovery and is now well. Normal weight has been regained, and there is no longer any evidence of disturbed metabolism.

This is a good example of the so-called catarrhal jaundice so frequently seen associated with gall-stones, though the concretions are in the gall-bladder or cystic duct and can therefore not be directly responsible for obstructing the flow of bile into the intestines.

The pancreatic ducts become infected at the same time as the bile ducts by the catarrhal process extending from the duodenum, and this leads to swelling of the head of the pancreas and so to pressure on the common bile duct and to slight obstructive jaundice.

It may be asked, why are not all cases of gall-stones in the gall-bladder associated with jaundice?

The explanation is an anatomical one,—in 62 per cent of all cases the pancreas embraces the third portion of the common bile duct, whereas in 38 per cent the bile duct passes entirely behind it, hence — although pancreatic catarrh or interstitial pancreatitis may be a

frequent concomitant of cholelithiasis, in only about two thirds of such cases will it be likely to lead to jaundice by pressure on the main bile channel, for if the choledochus passes behind and not through the head of the pancreas, the duct may escape when the pancreas is congested or otherwise swollen, whereas if it pass through the gland, any congestion or swelling of the pancreas will, by pressing on the common duct, bring on jaundice with its various sequelæ. Thus are also explained many of the cases of so-called catarrhal jaundice, which may come on as an extension from gastro-duodenal catarrh, or in the course of a pneumonia, or during typhoid fever, influenza, and other ailments.

I have proved this hypothesis to be correct at operations undertaken for chronic jaundice and diagnosed as chronic catarrhal jaundice in many cases quite independent of cholelithiasis, as in the following cases and in others reported in the Lancet for December 23, 1905, and for March 19, 26, and April 4, 1904.

A woman, aged 35, was seen on September 11, 1899, with the history of having been subject to attacks of spasms in the upper abdominal region for twelve years, the intervals between the seizures having varied from a few days to several months, but of late they had become much more frequent, and during the week before she was seen she had had four attacks, all severe ones. The seizures began with pain in the epigastrium, accompanied by cold sweats and faintness; the pain passed through the midscapular and to the right subscapular region and lasted from two to six hours, having to be relieved at times by morphia. Jaundice followed the seizures, and if the attacks recurred frequently it was intensified with each, but if there was a long interval only an icteric tinge remained. Palpation revealed a point of tenderness in the midline, one and a half inches above the umbilicus, where there was a sense of resistance with an abnormal fulness, but there was no tenderness over the gall-bladder nor could any swelling of the gall-bladder or liver be discovered. On September 21st a vertical incision through the right rectus exposed adherent viscera, and on the separation of the adhesions a thickened gall-bladder was exposed, but there were no gall-stones in it or in the ducts. The lower part of the common duct was surrounded and overlaid by a well-marked swelling of the pancreas, which was harder than usual, but not sufficiently hard to be mistaken for cancer, though it was somewhat nodular. Cholecystotomy was performed, and drainage was carried out for a fortnight. Recovery was uninterrupted and the patient returned home within the month, and she has remained well since.

As shewing that the gall-stones and cholangitis were not the cause of chronic catarrhal jaundice, the following case in which the jaundice persisted after their removal, but which was ultimately cured by cholecystenterostomy, will demonstrate.

Mrs. W., aged 57, had had two operations previouly in Scotland. On the occasion of the first operation in September, 1902, a number of gall-stones were removed from the gall-bladder which was drained for a few days, but after the wound had healed the attacks had been repeated as before. A second operation was undertaken by the same surgeon without finding anything definite in the gall-bladder. After the wound had healed, and the temporary drainage had ceased, the attacks again returned and the subsequent history up to the time of my seeing her was that she had almost daily attacks of pain accompanied by slight jaundice, and on five or six occasions, usually at intervals of a month, she had had violent seizures necessitating the use of morphia. About five weeks before I saw her the pain was so violent as to cause her to faint, and just before coming to London another violent seizure, accompanied by collapse, occurred. A rigor with high temperature, 104 or 105° F., had followed each attack, the temperature between the seizures rising to 101 or 102° F. She was rapidly losing flesh and strength. An examination of the urine showed no albumin or sugar, but a well-marked pancreatic reaction, rendering, along with other signs, the diagnosis of chronic pancreatitis certain. At the operation on November 20, 1903, the adhesions were found to be most extensive. There was well-marked enlargement and hardness of the pancreas along its whole length, but it was not nodular. The common duct was carefully examined, but found to be free from concretions, and on opening the gall-bladder a probe was passed through it and the cystic duct and common ducts into the duodenum. While the probe was in position the pancreas was manipulated and found to compress the duct, thus accounting for the obstruction. Cholecystenterostomy was therefore performed, the union being effected by means of a decalcified bone bobbin. At the time of operation the gall-bladder was separated from its fissure in the liver in order to make it reach the bowel without tension. For a few days after operation, bile was discharged from the torn liver surface in free quantities, but there was no leakage from the newly joined viscera. As the bile obtained a free passage into the bowel it gradually ceased, being discharged from the liver and the tube was able to be left out at the end of ten days. The wound healed by first intention, and the patient was up at the end of three weeks. She was then able to take and digest her food, and has since been quite free from her old attacks.

The following case illustrates the persistence of a catarrhal pancreatitis keeping up the jaundice even after the natural passage of a gall-stone.

A patient, aged 38, after being subject to indigestion for years had biliary colic in July, 1899, and passed gall-stones which were found in the motions. Subsequently the attacks of pain were frequent and severe, necessitating the use of morphia. They were usually accompanied by icterus, which, though slight, probably never quite disappeared. When I saw him in November, 1903, he had lost flesh, and was prevented from carrying on his professional duties. The metabolic and digestive signs of pancreatic catarrh were well marked. At the operation on November 23, 1903, no gall-stones were found, though the gall-bladder was thickened and adherent to contiguous organs. The pancreas was firmer than usual and compressing the common duct. Cholecystotomy led to recovery, though the drainage of the bile ducts had to be continued for three months. The patient is now well.

In this case the pancreatic catarrh had evidently been set up by the passage of gall-stones through the common duct. The pancreatitis had, however, persisted and was not only keeping up painful symptoms, but leading to obstruction of the bile ducts and to interference with nutrition. Now this case would formerly have been called catarrhal jaundice, whereas it was really due to catarrhal pancreatitis, as proved by the digestive and metabolic signs, and later by operation.

I could relate other instances, but this case will suffice to show that pancreatic catarrh may be produced by a passing gall-stone and persist after the cause has disappeared, and that drainage of the bile ducts is followed by cure.

If, after some time, the stone passes, the pancreatic catarrh may subside and leave no trace, or the swelling of the pancreas may persist, become true interstitial pancreatitis, and for a long time keep up pressure on the common bile duct, leading to a persistence of the jaundice, though there is no concretion left to cause obstruction nor any evidence of disease of the liver.

Drainage of the common or hepatic duct may have to be performed for jaundice due to interstitial pancreatitis where there is absence or contraction of the gall-bladder, either owing to the gall-bladder having been removed at a previous operation, or to its having contracted as the result of gall-stone irritation. This is a much less satisfactory operation than cholecystenterostomy, as drainage of the common duct has to be continued for some length of time and the biliary fistula is a source of great distress to the patient. I have had to drain the common duct in several such cases where it was impossible to relieve the patient in any other way; and in one case it necessitated the biliary fistula being continued for a considerable time.

This brings into prominence the undesirability of removing the gall-bladder as a routine procedure in operating for gall-stones, for unless it is seriously damaged or ulcerated, or is the seat of malignant disease, or unless there is ulceration or stricture of the cystic duct, removal is quite unnecessary. I think it better practice to drain it simply and not to perform cholecystectomy, since on some future occasion, should trouble develop in the deeper ducts or in the pancreas, and the gall-bladder be absent, it will be impossible, with few exceptions, to short-circuit the obstruction. Moreover, after cholecystotomy gall-stones have no greater tendency to re-form than they have after cholecystectomy, and should cholelithiasis again develop, it will be in the common duct, a much more serious position than if in the gall-bladder.

The following case affords a good example of the advantage of sparing the gall-bladder in operating for gall-stones.

Mr. T., aged 45, was seen on July 27, 1905, suffering from jaundice and a biliary fistula. He gave the history that he had been operated on in October, 1904, by a hospital surgeon for suppurating gall-bladder, but that the wound had never healed and a biliary sinus had persisted. He consulted a well-known continental surgeon, who advised operation. When seen he had a temperature of 100°F. and looked ill. He said that he was subject to shivering attacks. His tongue was coated, and there was slight jaundice. A biliary fistula was present, which was discharging a small quantity of bile and pus. He had lost weight considerably. The urine showed a well-marked pancreatic reaction, and the fæces contained a quantity of fat and muscle fibre.

I operated on July 28, 1905, when the abdomen was opened and the gall-bladder was separated from the fistula, which was excised. The head of the pancreas was hard, and evidently the seat of interstitial pancreatitis which compressed the common bile duct. No gall-stone could be felt in the common or hepatic ducts.

The gall-bladder was therefore connected to the duodenum so as to short-circuit the obstruction. The patient made a good recovery and forthwith began to regain his lost flesh, the jaundice disappeared, and his skin soon assumed a healthy colour.

He called to report himself in January, 1907, and said that he was in perfect health. An opportunity was taken of examining his urine some time after the operation, when it was found to be normal and to show no traces of the pancreatic reaction.

If the common duct is greatly dilated, it may be possible to make an anastomosis between it and the duodenum so as to short-circuit the obstruction in the head of the pancreas.

The following case affords an example of choledochenterostomy in such a condition.

Miss F., aged 28, was seen in June, 1903. She gave the history that four years previously she had had typhoid fever, since which time she had never been well. A year previously she had an attack of pain, followed by jaundice with some enlargement of the gall-bladder. An operation was performed in January, 1902, by another surgeon. No gall-stones were found, but the head of the pancreas was much enlarged. Cholecystotomy was done, and the wound healed within the month. She made a good recovery from the operation and was apparently well until March, 1903, when she had a recurrence of the jaundice with sickness and pain. She became very ill and rapidly lost flesh. When I saw her there was some enlargement of the gall-bladder, with a distinct cystic swelling over the pancreas, and the urine gave the characteristic pancreatic reaction. On June 4, 1903, an operation was performed, when a large cyst was found on the inner side of the gall-bladder, containing bile and pus, which was evidently a dilated common bile duct. No gall-stones were found, but there was some swelling of the head of the pancreas. The gall-bladder was also distended and inflamed, and it was drained by a separate tube. The patient made a good recovery from the operation and returned home wearing both tubes. She was seen again in October, 1903. Since the former operation there had continued to drain away through the tube in the dilated common duct from 20 to 30 ounces of bile, and from the tube leading into the gall-bladder from 4 to 6 ounces of clear mucus. The patient was thin and feeble, had no appetite for food, and was unable to digest anything beyond a little milk. An examination of the urine revealed the characteristic pancreatic reaction, and the fæces contained muscle fibre and much neutral fat. On the 8th of October a further operation was undertaken, when the head of the pancreas was again found to be much enlarged, but no concretions could be felt in it or in the common bile duct. The gall-bladder was completely excised and the cystic duct ligatured. The dilated common bile duct was then connected to the duodenum by means of a decalcified bone bobbin, and the wound was closed. The same evening the patient expressed herself as feeling hungry for the first time since her illness began. She straightway began to absorb whatever nourishment was taken, had her bowels moved on the second day, gained strength, resumed her natural colour, and made such a rapid convalescence that she returned home within the month, having gained 7 pounds in weight. In 1906 a report was received to say that the patient was in perfect health.

For the anatomical reason previously referred to, in only two thirds of all cases of common duct cholelithiasis is the pancreas likely to be involved, or if involved to participate in causing jaundice.

Curiously Dr. Cammidge's analysis of the urine in a very considerable number of cases of common duct cholelithiasis with more or less jaundice, in which I have subsequently performed cholecystotomy, has shown that in two thirds of the cases pancreatic catarrh or interstitial pancreatitis has been present, as shown by the characteristic reaction, whereas in about one third of the cases the presence of common duct stones was not associated with pancreatic disease.

This proportion corresponds with Helly's figures, based on anatomical research. He showed that in 62 per cent of bodies the pancreas embraced the common bile duct and in 38 per cent the bile duct passed behind the pancreas.

For some years, whenever I have been operating on the common bile duct for the removal of concretions, it has been my custom to pass a probe down the duct into the duodenum and with the fingers of the left hand to palpate the whole length of the duct, which is easily done when the probe is in position.

The result of these observations has been to establish the fact that when the bile duct passes behind the pancreas, the latter is seldom affected with inflammatory swelling, but when it passes through the gland and gall-stones have been present in the duct, the pancreas is practically always affected.

This was well shown in a case I operated on at Southport last week in which there was no pancreatitis, though there were gall-stones in the common duct, and in which after their removal I passed a probe down into the duodenum and could palpate the whole of the common duct from below, as no pancreas intervened, and the head of the pancreas felt in front of the duct was quite normal.

The same condition was also shown in another case that I operated on in London the next day.

If the gall-stone causing obstruction be

removed by operation from the common duct and drainage of the infected bile ducts be effected before the catarrhal has passed into the interstitial form of pancreatitis, a complete cure may be expected, as in the following case.

The patient, a lady, aged 34, had had symptoms of gall-stones for four years, and had been under treatment for ulcer of the stomach, but there had been no hæmatemesis. Four months previous to my seeing her, jaundice had come on after an attack of pain, since which time the attacks had been frequent and were always followed by an increase of the jaundice and by rigors and fever. On one occasion the gall-bladder was distended; when seen there was a slight tinge of jaundice. She had lost three stones in weight. There was an absence of enlargement of the liver or gall-bladder, but marked tenderness over the gall-bladder was elicited. The pancreatic reaction was obtained from the urine, and digestive symptoms were present.

At the operation on April 23, 1903, one large calculus was removed from the cystic duct and some smaller ones from the common duct by choledochotomy through separate incisions in the two ducts. The common duct was sutured and the cystic duct drained. The pancreas was found to be enlarged and inflamed. The patient made a good recovery and is now well, without any trace of pancreatitis being found by examination of the urine and fæces.

In another case, the patient, a lady, aged 59, began to suffer from abdominal pain, followed by jaundice and vomiting, 26 years ago, and she had been subject to attacks at longer or shorter intervals ever since. Fifteen years ago she was in bed for three months with constant pain, but never had rigors. A fortnight since she had a severe attack of pain followed by jaundice, which persisted. She had lost four stones in weight. There was no enlargement of the liver or gall-bladder, but some dilatation of the stomach. Pancreatic crystals were found in the urine. At the operation on March 10, 1903, a small gall-bladder was found containing two gall-stones, which were removed, and the gall-bladder drained. The common and hepatic ducts contained many stones, which were removed through an incision in the common duct, the gall-bladder being drained. The pancreas was swollen and compressing the common duct. The patient made a good recovery and remains well, as shown both by physical signs and the absence of a pancreatic urinary reaction.

The explanation of the pancreatitis in these two cases was manifestly the obstruction of the pancreatic duct, with infection of the secretion, but the complete recovery after operation showed that the inflammation was only catarrhal and not advanced interstitial trouble.

If the gall-stone obstructs the common duct for long, what was at first a simple catarrhal pancreatitis may assume a truly interstitial form, and unless drainage of the bile ducts is continued for some time, or permanent drainage in the shape of cholecystenterostomy is established, relapse will speedily occur, as shewn in several cases I have seen.

If the interstitial pancreatitis has persisted for some length of time, the recovery may be incomplete, and although the jaundice may disappear and the digestive symptoms may be alleviated, the metabolic signs found in the urine many months or even years, subsequently, show that the recovery is only partial.

The following are examples.

Mr. D., aged 45, had had painful epigastric attacks for twelve months, with vomiting, but no jaundice. There had been deep jaundice since January 1st, with ague-like attacks, and the patient had lost 2½ stones in weight. Cholecystotomy was performed on March 29, 1898. A swelling of the pancreas, thought at the time to be cancer of the head of the pancreas, compressing the bile duct was felt. Drainage of the gall-bladder was adopted, but the tube was only left in for ten days.

The patient made a complete recovery and in August was apparently quite well, having gained a stone in weight. He was in good health in 1901. Though apparently well in January, 1904, an examination of the urine gave the pancreatic reaction and showed that the original damage to the pancreas had not been completely repaired.

Mrs. D., aged 46, had had spasms for years. Acute seizures in July and three times since. Since July pain and sickness every two weeks. No tumour felt at any time; jaundiced occasionally after an attack of pain; lost one stone in weight. She had never vomited blood and never had melæna. There was tenderness over the gall-bladder, but no tumour. Enlargement of the head of the pancreas felt on palpation. Cholecystotomy performed on December 11, 1899. Empyema of the gall-bladder. Many stones removed from the gall-bladder and cystic duct. Adhesions broken down. Nodular condition of the head of the pancreas found. The patient made a good recovery and was well in 1904, though an examination of the urine showed the pancreatic reaction and proved that the metabolic functions of the pancreas were still not normal.

This brings me to the second part of my subject, the relation of interstitial pancreatitis to glycosuria.

Glycosuria is by no means a common symptom of pancreatic disease, and cannot be relied upon as a diagnostic symptom. When present it indicates a serious, although not necessarily a hopeless condition. The relation of diabetes to disease of the pancreas has been

clearly established in a considerable proportion of cases, but both experimental and clinical observations have shown that pancreatic glycosuria occurs only when the greater part of the pancreas has been removed or destroyed. The appearance of sugar in the urine along with other signs of disease of the pancreas, therefore, points to a wide-spread and advanced lesion. This is particularly the case in chronic interstitial pancreatitis of the interlobular type, which is the form that follows obstruction of the ducts by calculi and is produced by ascending catarrhal inflammations from the duodenum. *Interacinar pancreatitis* on the other hand gives rise to glycosuria at an earlier stage, but is a much less common disease than the interlobular variety. Malignant disease of the pancreas rarely causes diabetes, and then only, as a rule, when the whole organ has been destroyed by the growth.

The suggestion that the islands of Langerhans are concerned in the production of the "internal secretion" of the pancreas was first made by Laguesse. This view was subsequently adopted by Schäfer, Diamare, and others. The theory that such a relationship exists is based partly on histological grounds and partly upon the results of experimental work, but the most important evidence in support of it has been furnished by pathological observations, which suggest that pancreatic diabetes is due to a disturbance of the functions of the cell islets. The peculiarity of their structure, their independence of the duct system of the gland, and their comparative resistance to certain morbid changes by which the secreting acini are destroyed, point to their being independent organs with an independent function; while their rich blood supply may be taken to indicate that they are possibly vascular glands engaged in the elaboration of some internal secretion which is poured into the blood stream.

Opie considers that diabetes is peculiarly related to interacinar pancreatitis and that in the interlobular form it is rare. The difference, he considers, depends upon the relation of the fibrous tissue overgrowth to the islands of Langerhans, which he in common with many other observers believes are responsible for the elaboration of the internal secretion by means of which the pancreas exerts its influence upon carbohydrate metabolism. The newly formed fibrous tissue in interacinar pancreatitis is diffusely distributed within the lobules and between the individual acini, so that the islands are affected at the same time as the other elements of the gland, but in the interlobular form, which is the type following duct obstruction, the proliferation of fibrous tissue takes place between the lobules and invades them from the periphery, so that the cell islets suffer only when the process is far advanced, and the secreting parenchyma has been replaced by masses of scar-like tissue. Opie found that diabetes was present in 7 out of 9 cases of interacinous pancreatitis, but that in only one out of 21 cases of chronic interlobular inflammation of the gland was there sugar in the urine. In this one case of interlobular inflammation the induration of the gland was far advanced and the islands of Langerhans were fibroid. The two cases of interacinous pancreatitis in which diabetes was absent were both, he found, in an early stage of the disease.

The pathological changes that have been met with in the interacinar islets in cases of diabetes are hyaline degeneration, necrosis, atrophy with vacuolisation and liquefaction of the cell-protoplasm, acute and chronic inflammation with hæmorrhage sclerosis, or calcification, and diminution of the number of islets.

Opie's description of hyaline degeneration in the islands of Langerhans alone, in diabetes, furnished the most convincing evidence of the association of these structures with carbohydrate metabolism up to that time available, and from the publication of his paper in 1901 may be dated a revival of interest in the pancreatic theory of diabetes, and a more searching and minute enquiry on the part of other observers into the condition of the cell islets in fatal cases coming to post-mortem. In 19 cases of diabetes in which Opie investigated the condition of the islands of Langerhans, he found hyaline degeneration in 7 (35 per cent).

Chronic interstitial pancreatitis has been frequently observed in association with diabetes, but in the majority of cases where inter-

stitial changes in the pancreas arise from obstruction of the ducts by gall-stones, or from other causes, glycosuria is not met with as a symptom. In 65 consecutive cases where biliary calculi were found in the common duct at operation and in which the pancreas was enlarged and hard, sugar was detected in the urine of 4 (16 per cent). In 3 of these the amount was under 0.2 per cent, and in the fourth 0.4 per cent. After operation the sugar disappeared from the urine in all but the last, in which it slowly increased in amount, the patient dying from diabetic coma ten months subsequently. Since the interstitial changes arising from the presence of gall-stones in the common duct principally affect the head of the gland in the first instance, and the results of experiments upon animals have shown that even a small portion of healthy pancreatic tissue will prevent the onset of diabetes, or at least delay the appearance of the symptoms, so long as it remains undestroyed by fibrotic changes, the comparative rarity of glycosuria in these cases is not difficult to explain. When, however, a great part of the parenchyma has been destroyed, or is functionally impaired by the progressive changes consequent on repeated or long-continued irritation, either from gall-stones or an unrelieved duodenal catarrh, sugar will make its appearance in the urine, first as an alimentary glycosuria, and later as a permanent diabetes.

In some cases where operation has been delayed or drainage of the bile ducts not performed, or not long enough continued, the original interstitial pancreatitis may pass on into the interacinar variety, in which the islands of Langerhans become involved and glycosuria ensues, as in the two following cases.

Mrs. C., aged 51, who was suffering from persistent jaundice, with periodical pains and ague-like seizures that had extended over a long period, was operated on in July, 1895, when several gall-stones were removed and others crushed and removed from the common duct. A tumour of the pancreas was felt, which it was feared at the time might be malignant. The gall-bladder was therefore drained into the duodenum by a cholecystenterostomy. The patient completely recovered, and has remained well since the operation over nine years ago, but an examination of the urine recently by Dr. Cammidge showed an abundance of dextrose, but no acetone or di-acetic acid. The pancreatic reaction was obtained. This showed that although the patient has been relieved by the operation, and had apparently enjoyed good health, yet that she is living with a damaged pancreas.

Mr. D., aged 42, had an attack of pain in the right hypochondrium ten years ago, but no jaundice. He had been free up to six weeks ago, when he had a severe attack of pain in the right hypochondrium radiating to the back and shoulders, accompanied by rigors and vomiting and followed by jaundice. The jaundice had persisted up to the present. No swelling could be felt. An exploratory operation was performed on October 27, 1898, when a mass, thought to be growth in the head of the pancreas, was discovered. The patient made a good recovery, with a great relief to the jaundice. The enlargement of the head of the pancreas was evidently chronic pancreatitis, as it was too soft for scirrhus. It was freely manipulated in order to ascertain if there was a gall-stone in the termination of the common bile duct, and this may have dislodged an obstruction leading to the relief of the jaundice

A specimen of his urine was obtained in 1904, and although he was reported to be quite well, this was found to give crystals by the "A" reaction, which dissolved in half a minute, and to contain sugar in fair quantity.

This, along with other cases that I know of, leads me to think that it is unwise not to thoroughly drain the bile ducts, and I consider that drainage ought to be continued until the bile becomes free from organisms and its normal route is free from obstruction.

In certain cases, doubtless recovery occurs without operation, and I have notes of one case where a gentleman of advanced age had deep jaundice associated with glycosuria, and with well-marked pancreatic reaction in the urine, pointing to the case being one of pancreatic diabetes. Under general treatment, combined with massage, he regained his health and is now said to be quite well. In this case it is quite possible that the massage dislodged a concretion which was blocking the common bile duct and the pancreatic duct, but as no search was made in the fæces, this cannot be proved. As the patient lives abroad, I have not been able to test the urine, which, I suspect, will still contain glucose.

We may now consider the question whether operation ought to be declined because of the presence of a small amount of sugar in the urine. My feeling is, that should the patient's condition be fair, operation should be performed in order to remove the obstruction, or by drainage to arrest the pathological process going on in the pancreas.

The difficulty that attends all methods of treating diabetes is vastly increased by the obscurity of the etiology; but where it follows, or is associated with, evidences of pancreatic gall-stone trouble, the origin of the disease is plain, and in the early stages appropriate means of treatment can be adopted with a fair hope of success. I have already referred to 4 cases of cholelithiasis in my own experience that were accompanied by glycosuria and in 3 of which operation was followed by disappearance of sugar from the urine. Gifford Nash's case of acute pancreatitis with glycosuria may also be cited as an example of the satisfactory results attending timely operative interference. It is essential, however, that the disease should not be too far advanced, and for this reason I strongly recommend that all cases of pancreatitis and gall-stones likely to give rise to a pancreatic lesion should be operated on with as little delay as possible after they have been diagnosed. I have shewn that the early recognition of these conditions is not now a matter of great difficulty, if all the signs and symptoms to be obtained by a careful consideration of the clinical and pathological features of the case are taken into account; so that difficulty of diagnosis cannot be urged as a valid excuse for cases of pancreatitis being permitted to proceed untreated to a stage at which diabetes supervenes.

The advantage of cholecystenterostomy in interstitial pancreatitis is that it provides for permanent drainage of the bile passages, so that should the inflammatory tissue in the pancreas further contract and cause increased pressure on the bile duct, no jaundice will occur, and should the inflammatory process pass away, the patient will not be distressed by the presence of a biliary fistula or inconvenienced by the absence during that time of the bile from the intestines; moreover, there will not be the anxiety of any further operation to face, as there would be after a cholecystotomy. But besides the relief of jaundice, the operation acts on the pancreas by relieving tension and thus enabling the gland to discharge its contents, which, when infected and imprisoned in the ducts, tend to keep up inflammation and to lead after a time to atrophy of the gland substance proper and the formation of fibrous tissue.

It will be gathered from the foregoing arguments that I believe cholecystenterostomy to be the operation of choice for the treatment of interstitial pancreatitis, and only in case of absence of contraction of the gall-bladder, or in case of unusual difficulties from adhesion or from the serious condition of the patient, would I counsel cholecystotomy being done.

Results. In considering the after results of the surgical treatment of the class of cases under consideration it is necessary to give both the immediate risks of operation and the ultimate issue of those cases that recovered. To this end, letters were addressed to the friends or medical attendants of all patients who had not recently been heard of (this does not include cases since 1904).

Of 102 operations undertaken in patients where chronic pancreatic trouble constituted the chief disease, or where it formed a serious complication of other diseases, 96.1 per cent of cases were followed by recovery, giving a mortality of 3.9 per cent, but since compiling the foregoing figures, in 1904, experience has very largely increased and the mortality has diminished to a little over 2 per cent.

In the 55 cases of catarrhal interstitial pancreatitis where gall-stones were found obstructing the pancreatic portion of the common duct, choledochotomy was performed in 42, cholecystotomy in 9, and cholecystenterostomy in 4.

Of the 52 patients that recovered, 48 were living and well when last heard of; one is apparently well nine and a half years subsequent to operation, though sugar has recently been found in his urine; one died from cirrhosis of liver and ascites a year after, it being present and far advanced at the time of operation. Another has since died of acute bronchitis, and another from some other non-specified ailment.

In one case where the cause was pancreatic lithiasis and where calculi were removed both from Wirsung's and Santorini's ducts, the patient is now in very good health.

In 46 cases of interstitial pancreatitis without gall-stones or other removable cause, the bile ducts, and thus indirectly the pancreatic ducts, were drained in 19 cases by simple

cholecystotomy, in 17 by cholecystenterostomy, and in 5 by separation of adhesions and thoroughly freeing the ducts. Of the 45 patients that recovered, no reply to letters were received from 6, who were well some time after operation. The rest were in good health when last heard of, with the exception of one (not drained) who has developed glycosuria some years after operation, but is otherwise well; one who shows signs of permanent damage to the pancreas by the urinary test; and one who has anæmia suggestive of the pernicious type.

Besides the 19 cholecystotomies, were 5 where the pancreatitis was associated with duodenal ulcer, and in these cases a posterior gastro-enterostomy was performed at the same time, with good results in every case.

It will thus be seen that in a very large percentage of cases the removal of the cause, together with drainage of the bile ducts, or, in the absence of a removable cause, the simple drainage of the bile ducts alone is an operation that may be safely recommended in suitable cases that have failed to yield to general treatment.

PEPTIC ULCER OF THE JEJUNUM[1]

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PEPTIC ulcer was originally supposed to be confined to the stomach, but increased experience and more careful observation have resulted in the discovery that such ulcers occur very frequently in the duodenum. Peptic ulcer of the esophagus has been reported, and as a result of the operation of gastro-jejunostomy peptic ulcers are now occasionally found in the jejunum.

Peptic ulcer of the jejunum is an unusual condition. The first case was reported by Braun (1) in 1899, 18 years after the first gastro-enterostomy was performed by Wölfler in 1881. In 1903 Watts (2) collected 14, and in the same year Brodnitz (3) gathered 15 cases of this character. Mayo Robson (4), in 1904, analyzed 16, and Tiegel (5) in the following year was able to find 22 cases. In the literature up to January, 1906, Gosset (6) mentions 31 cases in a most complete review of the subject. Since then we have had 1 case in our experience and have noted 7 additional cases in available literature, making a total of 39 cases.

The great majority of reported cases have been those in which acute perforations have occurred. The supposition that many such cases are not reported or that the nature of the perforation is unrecognized is quite reasonable, as is likewise the probability that cases in which acute perforation has not taken place are attributed to other causes. These probabilities, with the rapid increase in the number of reported cases, tend to the belief that this condition is more common than the number of reported cases would seem to indicate. That it is a rare complication is without doubt, as is also the fact that it is a real danger. An estimate as to the percentage of gastro-enterostomies in which it may be expected to occur, is at present impossible because of the small number of cases. Kausch (7), from Mikulicz's clinic, reported 2 cases in 160 gastro-enterostomies. Watts (2) considers this too small a proportion. Paterson (8) found perforating jejunal ulcer in 3 of 295 such operations. He places the risk at less than 2 per cent. Robson's (4) case occurred in 30 anterior gastro-enterostomies, but such a complication did not occur in 16 posterior operations of this character, nor in 100 similar ones by a colleague. Moynihan (9) mentions one possible case in 218 gastro-intestinal anastomoses.

J. C. Munro (10) says, we have no definite data as to the occurrence of peptic ulcer. Such a lesion may explain the late unheralded hemorrhage in 2 of our cases of duodenal ulcer (in

[1] Read at Meeting of Western Surgical and Gynecological Association, December, 1907.

150 gastro-enterostomies). Rarely coming in the posterior operation, as statistics show, we believe the fear of this accident is a small contraindication in cases otherwise suitable for operation.

Jejunal ulcer is conspicuously absent in the remote results of gastro-enterostomy in the hands of American surgeons. In January, 1907, Hamann (11) reported the first perforative case in America. Two cases have occurred in experimental work, in a dog (Watts) (2) and in a cat (Gould) (12).

Peptic ulcer of the jejunum follows the operation of gastro-jejunostomy for benign conditions. The occurrence of such a jejunal ulcer without a previous gastro-enterostomy is unknown, and no case has been reported in which it followed a similar operation for malignant disease, nor has it been known to follow operations of pyloroplasty or gastro-duodenostomy.

PATHOLOGY

In both macroscopic and microscopic appearance the ulcer is similar to peptic ulcer occurring in the stomach or duodenum. It is usually single, in 3 of 24 cases it was multiple; in one instance 4 ulcers being present. It may be associated with similar ulcers of the stomach or duodenum. The usual location is at the stoma or in the jejunum, within from one to seven c.m., generally in the distal limb of the loop. In one case the ulcer was found near the stoma of an entero-enterostomy which had been perforated in addition to the gastro-intestinal communication.

ETIOLOGY

Mikulicz had one case occur after operation for congenital stenosis of the pylorus in a child three months of age. The other extreme in age was 59 years, the average being above 30 years. Male patients were much more frequently involved than the opposite sex. In 37 cases there were 35 males and 2 females. Ulcers of this variety occur after gastro-enterostomy, with or without stenosis of the pylorus.

It has been generally believed that the causative factor is the hyperacidity of the gastric juice, or the normal gastric juice coming directly into contact with the mucosa of the jejunum, without previous neutralization by mixture with the bile, pancreatic juice, and the succus entericus in the duodenum and upper jejunum. Most of these ulcers occur in the distal limb of the jejunal loop. In cases in which gastric analysis was carried out, the majority were found to have an excess of acid, though it was not constant. A noteworthy fact in this connection is that ulcer of the duodenum does not occur after pyloroplasty or gastro-duodenostomy, nor does peptic ulcer of the jejunum occur after gastro-jejunostomy in cases of carcinoma, in which there is generally a hypoacidity.

Paterson (13) says, the predisposing or the exciting cause of peptic jejunal ulcer is probably persistance, or subsequent development of hyperacidity after operation, and consequent digestion of the jejunal mucous membrane by the hyperacid juice. What then are the causes of hyperacidity after gastro-jejunostomy? I suggest that in most instances hyperchlorhydria is due to insufficient size or inefficient working of the anastomotic opening. I quite admit that a slight degree of gastric stasis, due to a small anastomotic opening, may have no ill result, but is it not reasonable to argue that in such a case a slight attack of gastritis, due to some error in diet, insufficient to cause trouble, if the anastomotic opening were larger, may lead to such a degree of gastric stasis that hyperchlorhydria ensues, and this produces, or at least disposes to peptic jejunal ulcer. Doubtless in some cases oral sepsis, or long continued indiscretions, or excesses in diet may lead to septic gastritis and stasis however large the anastomosis opening may be.

In one case direct traumatism to the abdominal wall was supposed to be the cause. Direct injury by food particles, or indirect injury to the mucous membrane at the time of operation may account for some of these cases. With arterio-sclerosis of the vessels of the mesentery, a very slight kinking of that structure may interfere with the blood supply and so predispose to the formation of ulcer.

The frequent occurrence with the anterior operation has been explained by an interference with the circulation of the loop as it was brought over the colon and the omentum. In Mikulicz' consideration of the subject, he

stated that it always followed anterior gastro-enterostomy, but in 34 cases in which the location of the anastomosis is mentioned, it is found that the anterior method was employed 25 times, in 6 of which an additional entero-anastomosis was made, and in 1 a previous pyloroplasty had been done and 9 in which posterior gastro-enterostomy was the route chosen, only 2 with entero-enterostomy.

In the 2 cases occurring in animals the operation was anterior, and in this connection it must be remembered that Cannon and Blake (14) have shown that the anterior operation in animals is the nearest possible approach to the conditions of the posterior operation in man.

The great majority of the above cases are from the German clinics, where the anterior operation has most frequently been employed. As to whether the loop of the jejunum was twisted or not, we do not find sufficient data to warrant an opinion as to this being a possible etiological factor. But in the posterior operations there has probably been a twisted and longer loop than is customary with the more recent and perfected technique, which brings the opening in the jejunum farther from the duodenum. In the posterior operation the jejunal opening is about 9 inches from the origin of the jejunum; in the anterior operation the opening is from 16 to 20 inches from that point.

It would seem with the no loop and no twist posterior gastro-jejunostomy, that the danger of peptic jejunal ulcer is reduced to a minimum.

Of 17 cases in which the method of anastomosis was mentioned, the suture was used 10 times, the Murphy button 6 times, and the Robson bobbin 1 time.

SYMPTOMATOLOGY

The symptoms are those of gastric or duodenal ulcer. Jejunal ulcer should be considered as a possibility in every case in which there is a return of the symptoms for which the gastro-enterostomy had been performed. The symptoms may be latent and may be ushered in by an acute hemorrhage or perforation, with intense pain followed by the usual signs of peritonitis. Acute perforation and general peritonitis took place in 14 of 39 cases.

The more usual history is that of chronic perforation, as is shown by a return of the original stomach symptoms with pain, nausea, vomiting, hyperacidity melana with local tenderness and rigidity. Such a condition was found in 25 of the cases, in 3 of which there was an internal fistula communicating with the large bowel.

The length of time between the operation and the onset of the symptoms may vary within marked limits. The presence of a symptomless period, of longer or shorter duration, after the gastro-enterostomy is necessary, for the purpose of excluding an uninterrupted continuation of the symptoms for which the operation was performed.

In 36 cases in which this interval was mentioned there were:

8 cases in which it was 6 months or under.

between ½ and 1 year.

1 " 2 years

2 " 3 "

3 " 4 "

5 year

The shortest interval was 10 days and the longest 9 years.

A differential diagnosis can rarely be made between such conditions as peptic ulcer of the jejunum and a return of gastric or duodenal ulcer, complete or partial closure of the stoma, adhesions, kinks, or other forms of incomplete obstruction, or the so-called viscous circle.

TREATMENT

The treatment will primarily be prophylactic, which will consist of internal medication in post-operative-cases, such as sodium bicarbonate to reduce or counteract an excess of hyperacidity, which should be continued for at least a number of months by which time it may rationally be supposed that the jejunal mucosa has become accustomed and resistant to the abnormal and irritating chyme that enters through the stoma. After the onset, the treatment will be either medical or surgical, according to the variety of the symptoms. With the chronic cases, some will be improved

or cured by the regular routine medical treatment for gastric ulcer (2 such cases in 40), others will persist in spite of such treatment and will therefore demand operative interference.

With acute perforation there is of course nothing to be considered but prompt surgical intervention, with repair of perforation and treatment of peritonitis. Various possible operative procedures may be carried out, such as inversion and suture of the ulcer, excision of the ulcer, resection of the jejunum with or without entero-enterostomy or jejunostomy, gastro-enteroplastic operations, secondary gastro-enterostomy, separation of adhesions, or drainage of abscess. If pylorus is patent, with no demonstrable ulcer of stomach or duodenum, the stoma may be closed. The peritonitis will be treated according to generally accepted lines, i.e., removal of the cause by closure of the perforation; no irrigation, with drainage, Fowler's position, and proctoclysis.

Since the publication of the monograph by Gosset (6), which reviews the subject up to January 1, 1906, we report one personal case and collect seven from available literature.

Case 1. In our own case anterior gastro-jejunostomy was performed by C. W. Oviatt in 1903, for gastric ulcer, with pyloric stenosis and dilatation of stomach. This was followed by relief for two years, after which there was a gradual return and increase of stomach symptoms. Three years after the operation these symptoms demanded a second operation, at which there was found a cicatricial stenosis of the pylorus with dilatation of the stomach, and practical obliteration of the gastro-intestinal stoma. A piece of linen about half an inch long was buried in the mucous surface at the linear cicatrix which marked the site of the gastro-intestinal anastomosis. At one end of this cicatricial depression, the end toward the cardia, there was a marked induration or thickening of the jejunal wall. This mass was about one-half inch in length, one-quarter inch wide and elevated one-eighth of an inch above the surrounding mucosa. It was fibrous in consistency, with its surface white and smooth. It extended through the jejunal wall to the greater curvature of the stomach, to which it was adherent.

A second anterior gastro-enterostomy was made with prompt and (thus far, 9 months) permanent recovery.

Case 2. Dudgeon and Sargent (15) report a case of perforation of a peptic ulcer of the jejunum occurring in a male 30 years of age, 22 months after gastro-enterostomy for simple gastric ulcer. Acute symptoms had been present for four hours before operation. The perforation was close to the stoma around which the peritoneum was reddened and covered with flakes of lymph. Invagination of the ulcer with flushing and drainage was followed by recovery.

Anterior gastro-jejunostomy showing healed perforated jejunal ulcer at one extremity of the obliterated stoma.

Case 3. Hamann (11) did anterior gastro-jejunostomy with entero-enterostomy in a male 48 years of age, for gastric ulcer; Murphy button used at each anastomosis. Smaller button passed on the eleventh day, with smooth convalescence until the twenty-first day when he complained of epigastric pain, with the development of a tender indistinct mass in the epigastric and left hypochondriac regions. Death occurred suddenly 26 days after operation. Autopsy showed perfect gastro-intestinal union with a perforated ulcer about one inch in diameter, with a sharply marked border on the anterior wall of the jejunum just beyond its junction with the stomach. The button was in situ, but this was not considered to be the cause of the ulcer. The ulcer was located exactly where the gastric contents would come in contact with the jejunal mucosa. There was a general peritonitis.

Case 4. Lyle (16). Male, 26 years; was operated upon for acute perforation of a gastric ulcer near the pylorus; there was no stenosis or dilatation. There was marked increase in gastric acidity. The perforation was closed, followed by posterior gastro-enterostomy with entero-enterostomy. Six months after operation symptoms returned which were relieved by medical treatment.

Case 5. Rushton Parker (17) reports a male, 51 years, who died suddenly because of perforation of a jejunal ulcer three years after anterior gastro-enterostomy for a non-malignant pyloric stenosis. (A pyloroplasty had been previously performed.)

Case 6. Basil Hall (17) reports a sudden death while drunk, from a perforated ulcer of the jejunum, located 6 inches below the stoma two years after anterior gastro-enterostomy for dilated stomach.

Case 7. Graser (18) has seen peptic ulcer of the jejunum with perforation and fatal hemorrhage four years after posterior gastro-enterostomy with Murphy

button. The stoma was reduced to the size of a lead pencil.

Case 8. Edington (19). Male, 46 years. Seven years ago had anterior gastro-jejunostomy performed for benign pyloric stenosis. Two years ago had cholecystostomy for gallstones. Present operation 27 hours after perforation of jejunal ulcer. Ulcer closed and omentum attached to line of suture. Death in 3½ hours.

Of these 39 cases, 29 are from the German, 5 from the British, 3 from the American, and 2 from the French literature.

In addition to the above undoubted cases since the publication of Gosset's statistics, the following probable cases have been mentioned:

Hadra (20). This case has been included in the statistics of some writers and omitted from others. Six months after gastro-enterostomy for pyloric stenosis with hyperacidity, perforation took place; this resulted in the formation of an abscess which was drained and was followed by a fistula. Hadra was unable to determine whether the perforation was in the stomach or the jejunum.

Moynihan (9) speaks of one case in which adhesions around the jejunum of the proximal side of an anastomosis were taken to indicate the possible existence of a peptic ulcer.

Munro (10) states that peptic ulcers of the jejunum may have been the cause of the unsatisfactory results in two cases.

CONCLUSIONS

1. Peptic ulcer of the jejunum is a possible result of gastro-jejunostomy for benign lesions of the stomach.

2. It is probably of more frequent occurrence than the 39 reported cases indicate.

3. It follows the long loop operation more often than the no loop operation.

4. The symptoms may be latent until either acute hemorrhage or perforation occurs.

5. The symptoms may be chronic and simulate those of gastric or duodenal ulcer.

6. Peptic ulcer of the jejunum should be considered in all cases of return of symptoms after gastro-jejunostomy.

7. A symptomless period after the operation, is necessary to eliminate a continuation of the condition for which the gastro-jejunostomy was performed.

8. A differential diagnosis can rarely be made before operation.

9. Prophylactic treatment, aiming to reduce the excess of acidity, should be instituted after all gastro-jejunostomies for benign conditions, and should be continued for at least six months.

10. Treatment will be either medical or surgical, similar to that for gastric or duodenal ulcer.

11. The possible occurrence of ulcer of the jejunum is an additional reason for performing gastro-jejunostomy only where it is positively indicated, i.e., by pyloric obstruction.

Note.—Since this article has been in the printers' hands I find a recent contribution on "The Surgical Treatment of Ulcer of the Stomach," by Einar Key, in the Nord. Med. Arkiv, Afd. 1, (Kirurgie) [illegible] which 5 cases of peptic ulcer of the jejunum are reported from the clinic of Berg, and 1 from that of Lenander. The latter is notable, as it is the first instance in which this condition is reported as a result of gastro-enterostomy for carcinoma of the stomach.

In addition to these 6 cases, 49 are collected from the literature.

BIBLIOGRAPHY

1. Braun. Verhandl. d. Deut. Gesellsch. f. Chir., [illegible]
2. Watts. Johns Hopkins Hospital Bulletin, July, [illegible]
3. Brodnitz. Annals of Surgery, December, 1903, [illegible]
4. Robson, Mayo. Annals of Surgery, August, 1904, p. 186.
5. Tiegel. Mittheil. a. d. Grenzgeb. der Med. u. Chir., 1905, p. 897.
6. Gosset. Rev. de Chir., January and February, 1906.
7. Kausch. Verhandl. d. Deut. Gesellsch. f. Chir., 1902.
8. Paterson. Gastric Surgery, 1906, p. 22.
9. Moynihan. Surgery, Gynecology and Obstetrics, June, 1907.
10. Munro. Annals of Surgery, June, 1907.
11. Hamann. Cleveland Med. Jour., May, 1907.
12. Gould. Operations upon the Intestine and Stomach, 1906, p. 46.
13. Paterson. Gastric Surgery, 1906, p. 20.
14. Cannon and Blake. Annals of Surgery, May, 1905.
15. Dudgeon and Sargent. The Bacteriology of Peritonitis, 1905, p. 68.
16. Lyle. New York Med. Jour., 1906, December 22.
17. Paterson. Gastric Surgery, 1906, p. 141.
18. Graser. Progressive Medicine, June, 1907, p. 83.
19. Edington. Glasgow Med. Jour., June, 1907.
20. Hadra. Verhandl. f. Deut. Gesellsch. f. Chir., 1900.

HIRSCHSPRUNG'S DISEASE[1]

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THIS extraordinary specimen of bowel which I here present to you is the first case of its kind on record in the United States, according to the literature available and to inquiries which I have made among surgeons and anatomists. I shall not go into great details, as I intend to publish the case in extenso later on, and I should like only to touch upon the most cardinal points of the anamnesis, definition, symptomatology, diagnosis, and the anatomy.

This enormously large bowel was taken from a child two years of age. I made a correct diagnosis before operation, a point of great importance to me, as in consequence of this I believe that after the knowledge of this peculiarly rare disease has been more widely spread, more cases will be found which are traveling now from one doctor's office to another and from one dispensary to another, with all kinds of labels except the right one and subjected accordingly to all kinds of erroneous treatments.

Definition of the disease. Hirschsprung's disease or mega colon manifests itself in a persistent high grade obstipation and large distension of the abdomen which is caused by an enormous dilatation of the sigmoid flexure and of the colon. The symptoms are observed either right after birth or develop in the first months or years of life. Very rarely has an alike condition been observed in adults. The disease has terminated in by far the greater number of cases in death, which was preceded often by a colitis and a development of numerous ulcers caused through stretching of the dilated colon.

As in regard to anamnesis, the infant in this case had never been well a single day of its life, always suffering with great obstipation, the bowel movements were very rare, with even days of intervals, and then the evacuations could take place only in peculiar contorted positions of the body and the legs, attended by great efforts and pains. The amount passed at a time was unproportionately small and often accompanied with very offensive odor. From birth the abdomen had been noticed to be abnormally large and had augmented more and more in undue proportion to the general development of the body. When I saw the child at my office a few days before the operation, it was then in emaciated condition, with an expression of long lasting suffering and misery in its poor, white, faded face, out of which two dim eyes looked, tired and nervous. The bare body showed all over great retardation of development through malnutrition. Arms and legs very thin, ribs poorly covered with integument, absence of all adipose tissue, but in striking contrast to all those skeleton-like conditions of the body rose an enormously large abdomen. While looking over the abdomen a phenomenon of very peculiar kind engaged suddenly my whole attention. When one has seen this once one will never forget it. It consisted in a heaving of the abdominal wall as though an arm was moving to and fro inside of the abdomen, trying to burst through the wall, raising it six to eight inches in height. Instantly my mind reverted to a phrase of one of the German authors on the subject, "das Gewühl der Gedärme," and simultaneously the diagnosis of Hirschsprung's disease applied to it. I know of no condition in the abdomen that could produce a likeness in appearance. This "Gewühl der Gedärme" meant nothing else than the most forceful, but almost absolutely futile peristalsis of the enormously dilated and hypertrophied colon with its bag-like enlarged descending colon and still more dilated sigmoid. Anamnesis and further examination made me certain of the correctness of my diagnosis. Thus I mentioned the fact to some of my friends at the hospital, hunted up the corresponding literature in my library and showed the illustrations of Roth, Parthes to them, but the case seemed to have drifted away until some days later it presented itself for operation, upon

[1] Read before the Chicago Surgical Society, November 1, 1920.

Fig. 1. Showing large bowel with normal rectum below.

Fig. 2. Entire colon. Notice U-shaped sigmoid.

which I had decided from the first moment of my diagnosis as the only possible way of perhaps doing something adequate for the otherwise hopeless patient. Another examination, previous to the operation, could not change my diagnosis. However, there was one factor which seemed very strange, namely, why the emaciated child should weigh so heavy. This point was cleared up very readily when we had the large bowel outside of the abdomen and found it full with fecal contents to such an extent that its quantity filled a pail. The heart beat was two ribs higher up. The liver could not be lined out, as the full bowel had pushed it very high up under the ribs, so that its upper surface was turned down toward the diaphragm. Respiration was very frequent and impaired, pulse very thin and rapid; the distended bowel encroaching very strenuously upon the thoracic cavity and its organs, pushing the diaphragm up to its utmost limit and filling out its whole dome. When through a median koliotomy the abdomen was opened, the largest part of the bowel, which later on proved to be the sigmoid, forced its way out to some extent. It gave the appearance of an hypertrophied, enormously large stomach of an adult, occupying the entire right side from the sternum to Poupart's ligament and from the right crest of the ileum to the left pararectus line. The colon descendens, which also had been transformed into a bag-like shape, was situated in the left side, filling out the space from the arch of the ribs to the left spina ilei and formed with the sigmoid flexure the figure of an inverted letter U. The dilatation of the bowel was not limited to the sigmoid and descending colon alone, as in other cases recorded, but involved to quite an extent, while not all over as colossal in dimensions as at the sigmoid, the whole colon clear up to the ileum. The surface of the bowel was shiny-bluish, and all the haustra were effaced. The muscular coat of the bowel is heavily hypertrophied. The dimensions are as follows: While

in the adult the length of the colon measures about 130 to 145 c.c.m., in this case we find it 154 c.c.m.; sigmoidal sac 21 c.c.m. in diameter; colon descendens 15 c.c.m. in diameter; colon transversum on several places 20 c.c.m. in diameter; the rectum 2 c.c.m. in diameter and ileum 1 c.c.m. in diameter. The mesentery was abnormally long and the blood vessels in it were very large. In regard to the inverted letter U-shaped form, I would like to call your attention to what happens when I inflate the collapsed bowel with air. You will readily observe that the nearer we come to filling the bowel to its full capacity, the more pronounced this distinct U-shape develops, until finally the two "Schenkel" arms of the bowel assume such a close approximation that they lie in contact apposition.

The sigmoid, with its colossal circumference, abruptly narrows at its distal end to assume the proportions of the normal rectum. The effect of the sudden termination is not unlike a child's toy balloon, the rectum being the small opening by which it is inflated. The small rectum, with its thin walls, is in very marked distinction to the directly above enormously enlarged hypertrophied sigmoid, and it is here at this junction where our exploring bougie stopped and could not be carried any further up into the bowel during examination. Without going into any far-off speculation or enumerating the different theories as to the etiology, development, and the mechanism, I should like to draw a picture of what perhaps happens when the sac-like enlarged sigmoid is full of contents, bearing in mind that the rectum is well fixed to the bone while the abnormal sigmoid, furnished with a very long mesentery, is permitted quite a range of motion. Those two points are paramount in judging the mechanical circumstances, and, therefore, I like to differ from the other authors on their theories concerning this point, especially the valve-like projecting part of the sigmoid.

The large sigmoidal bag, when filled with fecal matter, will sag downwards and outwards, that is to say, towards the right side and backwards, consequently it will pass pararectally downwards for reason of gravity and by permission of the long mesentery; and then arrived at the end of its allowance of excursion on the part of the mesentery, it will take a turn around its own axis to some degree, and thus twist and kink at the portion of the junction of the rectum which itself, being normal, is fastened in place stationary and cannot follow the axis motion of the lumen of the enlarged bowel. In consequence of that, the lumen of the rectum is from partially to entirely occluded. As in regard to the treatment, I stated before that the child had been in an emaciated condition and that our interference would be a last resort. I had most of the different propositions of the various authors and their experiences well in mind and intended at first to simply establish a prætternatural anus, but when I encountered additional enlargements of the same size as the sigmoid in the colon transversum, and even some in the ascending colon, attached to an abnormally long mesentery, I forsaw further danger from kinking and obstruction and obstipation. I call your attention to the different parts of enlargement, especially in the transverse colon, with points of constriction, of which one in particular is very pronounced, therefore I decided to follow Neugebauer's advice: "The exclusion of all diseased parts of the colon and anastomosis distally from the occasionally present valve occlusion ('Ventilverschluss') may be named as requisitions for a successful operation." The whole colon was diseased, consequently I removed it in its entire length up to Bauhin's valve, including the appendix. Then I performed an end to side anastomosis between the ileum and the rectum, which was carried out very rapidly and easily, as the mesentery of the ileum allowed full approximation of the bowel.

The patient did splendidly after the operation. There was no vomiting at any time. Patient took nourishment the second day and was quite bright, sleeping at intervals, with normal pulse and normal breathing. Gases passed freely, so everything went along very satisfactorily for 32 hours, when with a sudden gasp the patient turned to the side and died without warning. Cause of death, embolism.

LACERATIONS OF THE PERINEUM[1]

Their Causes, Formation, and Primary Repair, with Report of Forty-Eight Illustrated Cases

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THE subject of perineal lacerations and repair is one which has been debated amongst medical people for many years, and the more debated, the more obscure the subject has become. The multitude of operations which have in recent years been exploited is evidence of the lack of uniform appreciation of the underlying causes, processes, and mode of repair of these wounds.

Although modern gynecologists have been most successful in the treatment of these conditions, the possibility of their successful treatment has long been known. The first historical reference to the subject is found in an early work supposed to have been handed down by tradition and edited by an unknown author who states that Tortula, a midwife attached to the school of Salernum, who lived in the eleventh century, cured a laceration of the perineum by operation — "Postmodum ruptura intra anum et vulvam tribus locis vel quatuor suimus cum filo de serico" (1).

Ambrose Paré (2) was another of the early investigators of the subject and is credited with having performed the operation. He reports a cure of two cases, but does not state that the operation was done immediately after labor. He gives directions as follows: "But if through the violence of extraction the genital parts are torn, so that the two cavities, the rectum and vagina, are torn into one, the tear must be stitched up, and the wound cured according to want. I have thus cured two women living in Paris."

Various other investigators followed Paré, amongst them his pupil, Guillemeau, (3) who operated upon one case of complete rupture of the perineum six weeks after labor. He pared the edges of the old cicatrix and used one figure-of-eight and two interrupted sutures. The operation was a success. Others who performed the operation for complete tear were De La Motte, Morlanne, Saucerotte, Noël, and Dupuytren in France, Rowley in England, and Osiander and Dieffenbach in Germany. Dieffenbach (4) wrote extensively upon the subject of complete perineal tear and followed the plan of making lateral incisions at each side of the perineum after suturing the recto-vaginal septum. In 1837 he advised the primary repair of all lacerations of the perineum, including first and second degree tears.

Amongst American surgeons Mettauer (5) of Virginia published a report of a successful operation for complete tear six months after its occurrence. He used sutures of lead and fastened them by twisting.

Roux (6) wrote extensively upon the subject and published many successful cases of complete perineorrhaphy. He was an earnest advocate of the operation.

Amongst those who did primary operations for incomplete tears of the perineum were Bayer (8) in 1823, Churchill (9) in 1824, and Williams (10) in 1827, while Alcock (11) performed the intermediate operation for incomplete laceration in 1820.

The secondary operation for laceration of the second degree tears also was first done about this time. Fricke (13), in 1835, has done the operation four times with three successes. Nick (14) also reported in 1838 that he had done two operations for incomplete tear of the perineum. Baker Brown (15) was, however, the surgeon who did most to bring the operation into general use and encouraged others to study the subject of perineal injuries. In 1866, Baker Brown had done 112 operations upon the perineum. His work stimulated Savage (16) to excellent researches upon the anatomy of the perineum, which have remained classic in gynecological literature.

Following after these were Hegar, Sims, Agnew, Emmet, A. Martin, and Lawson Tait.

[1] Read before the New York Academy of Med[illegible]

Of these, Emmet (17) has been the greatest contributor toward the subject and recognized that the torn muscles and fasciæ caused a loss of support to the pelvic floor. His operation is the one commonly performed at the present time.

Since the time of these masters, a multitude of new operations have been devised to restore the anatomical support of the pelvic floor and close the perineal wound, caused by descent of the head at labor. All these operations have as their aim the intimate approximation of the edges of the torn fasciæ and muscles. To this end, in secondary operations, many forms of denudation of the vaginal mucous membrane have been exploited. The majority of these attempt the excision of the scar tissue of the old wound and the restoration of the torn muscles and fasciæ.

Without a proper appreciation of the causes, processes, and forms of perineal rupture, it is useless to attempt to judge the value of each modification of the various operations. With this end in view I have made sketches of forty-eight consecutive perineal lacerations at the time of labor and have noted the most evident and directly causative factors. These lacerations occurred in 100 women, of whom 90 were primiparæ. This gives a percentage of occurrence of forty-eight percent, which is within Williams' estimate of 45 to 58 per cent. Every wound of the mucous membrane other than a small tear of the fourchette has been reckoned in the series, none over 1.5 cm. in length have been excluded.

The various causes of perineal laceration are usually cited as follows: 1. Too rapid expulsion of the child, so that tearing of the perineum instead of stretching results; 2. Relative disproportion between the presenting part and the parturient outlet; 3. A faulty mechanism of labor whereby the largest circumference of the head passes the perineal ring; 4. The use of forceps.

Rapidity of delivery is without doubt the most frequent cause of perineal laceration. This is particularly seen in those cases of precipitate delivery where the head comes through the birth canal rapidly and impinges upon the perineum with almost the force of a blow. This rapidity of advancement of the head is sometimes seen in cases of contracted pelvis, where strong uterine pains are required to force the head through the bony pelvis, with the result that the less resistance of the soft parts does not retard its way. The quick descent of the head was also seen in one case (No. 25), where the membranes had remained intact until the head had come through the brim; when the membranes ruptured, the head was advanced with great rapidity, causing a laceration in a multipara with a comparatively lax outlet.

The passing of the head through the perineal outlet should undoubtedly be retarded, until the parts have softened and stretched. A preliminary digital stretching is most useful in primiparæ, although often a painful procedure. It can, however, be done during the labor pains and is a means of stimulation of their force and frequency.

A frequent cause of perineal laceration is the pressure of the head upon the perineal body and the lack of retraction between pains. The maternal parts become bloodless and tense, and tear readily with further descent of the head. An additional factor in the production of this condition is the attempt to control expulsion by pressing the taut perineum against the sinciput. This wounds the perineum and aids in the production of the anemic condition. The advancement of the head should be controlled without making any pressure upon the perineum.

Strong pains are a definite factor in the production of perineal injuries, but may be readily controlled by chloroform.

Relative disproportion between the presenting part and the parturient outlet is commonly thought to be one of the main causes of perineal injuries.

In any attempt to estimate the size of the fetal head in relation to the perineum, it should be decided which is the greatest diameter of the fetal head to engage in the perineal ring. In this study, it will be considered to be the occipito-frontal diameter, which comes into relation with the perineum by the final extension of the head. It is the diameter most capable of accurate measurement and gives a more dependable estimate of the size of the fetal head than do the suboccipito-bregmatic

or biparietal diameters. The various circumferences of the fetal head offer too much possibility of error in measurement to make them useful as indications.

Therefore, in attempting to estimate the size of the presenting part in its relation to the size of the perineal ring, the greatest engaging diameter, the occipito-frontal, is taken as a criterion. However, as the size of the head increases in direct proportion to the weight of the child, the increase of weight in its relation to perineal lacerations is also considered. This increase in the size of the fetal head in proportion to the weight was shown to be constant in 100 cases studied in its relation to intra-uterine cephalemetry (19).

In this series, the 48 perineal lacerations may be divided into two classes: 1. Those not involving the muscle, and 2. Those involving the muscle of the perineum. Of those not involving the muscle, there were 21. The average weight of the 21 babies was 3,310 grammes, and the average occipito-frontal diameter was 11.27 cm. The 27 cases of lacerations involving the muscle had children averaging 3,550 grammes, and with an average occipito-frontal diameter of 11.75 cm. The average weight of 100 babes, of whom these 48 cases here reported are a part, was 3,300 grammes, and the average occipito-frontal diameter was 11.40 cm. Therefore the result may be summarized:

	O.-F. Diam.	Weight.
21 cases of laceration not involving muscle	11.27	[illegible]
27 cases of laceration involving muscle	11.75	3,550 gm.
100 cases, including 48 cases of laceration	11.4[illegible]	[illegible]

From this summary it will be seen that the babies causing lacerations not involving the skin were of average weight, but of less than average size of head; while those causing lacerations involving muscle were of more than average weight and size of head. However, the slight increase in weight of two hundred grammes (7 oz.) can hardly explain the causation of the lacerations in view of the fact that the heads were but slightly larger than average. Nor will the fact that, in 21 cases of minor lacerations, the fetus was of average weight and less than average size of head explain the causation of these tears.

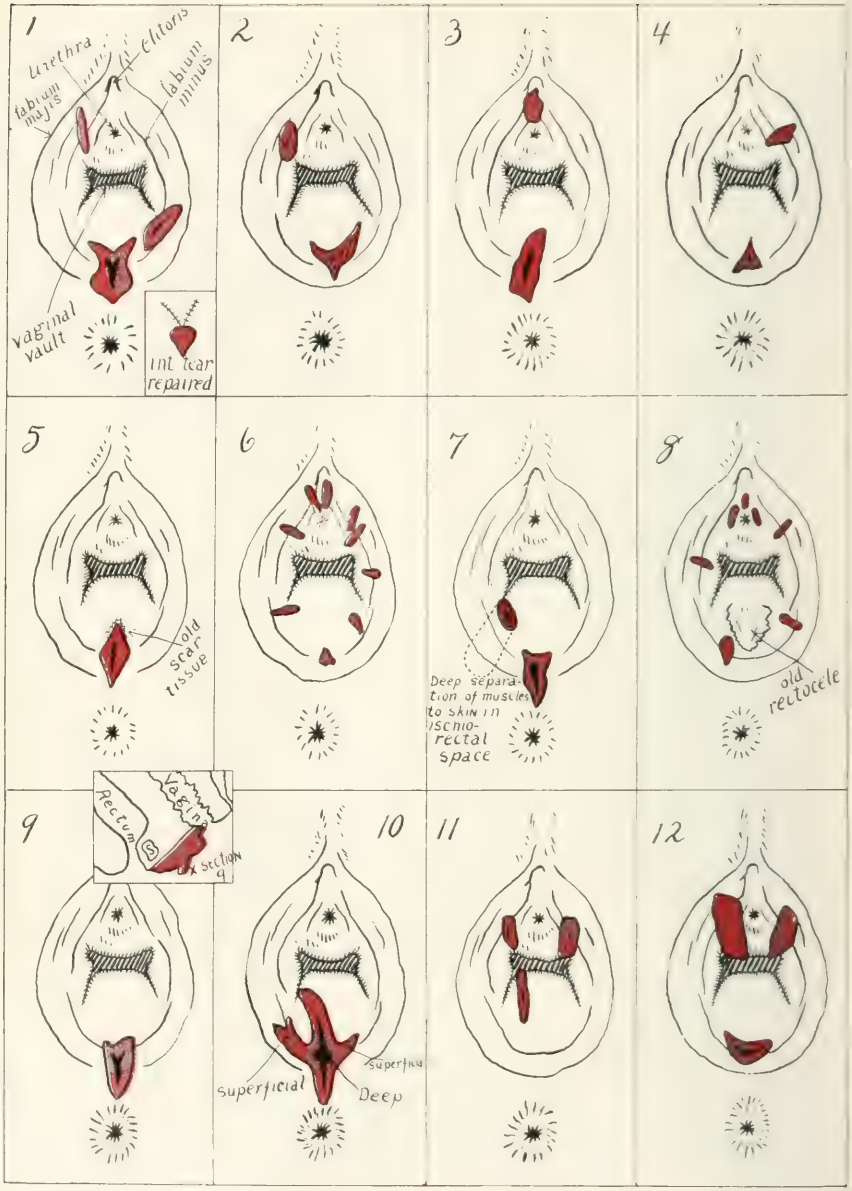
The causation of perineal lacerations, while undoubtedly influenced by considerable increase in size of the fetal head, does not depend to any extent upon this condition. It must, therefore, depend more upon the size and condition of the perineum itself than upon the size of the fetus and fetal head. The disproportion may be due to firmness of fiber and rigidity of perineal structure.

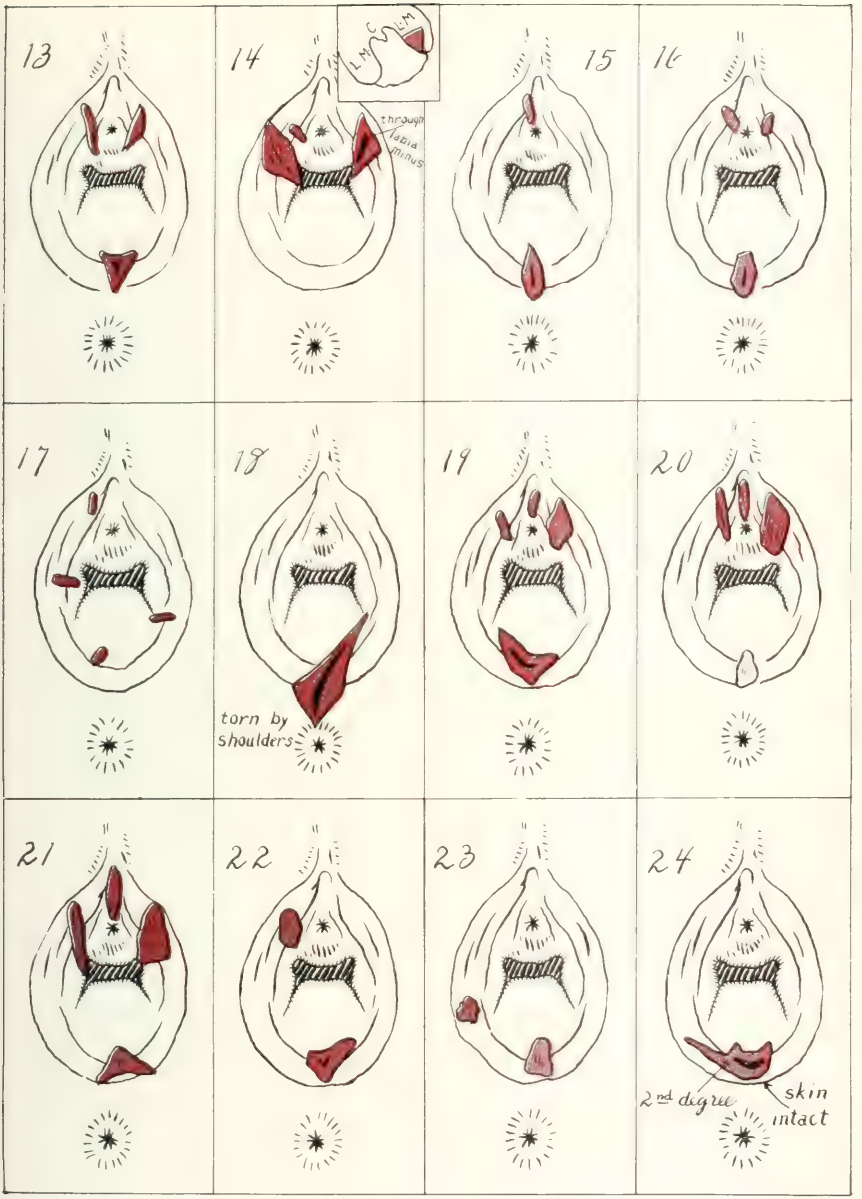
Faulty mechanism of labor is undoubtedly the cause of a small percentage of lacerations, but this has an influence in but a small number of cases. Amongst them are those cases where the occiput does not present under the symphysis as in delivery by face to pubes. Whenever the flexion of the head is not sufficient, a larger diameter than necessary must pass the perineal ring. If flexion is good, the occiput may pass under the pubic bones before the occipito-frontal diameter engages in the outlet.

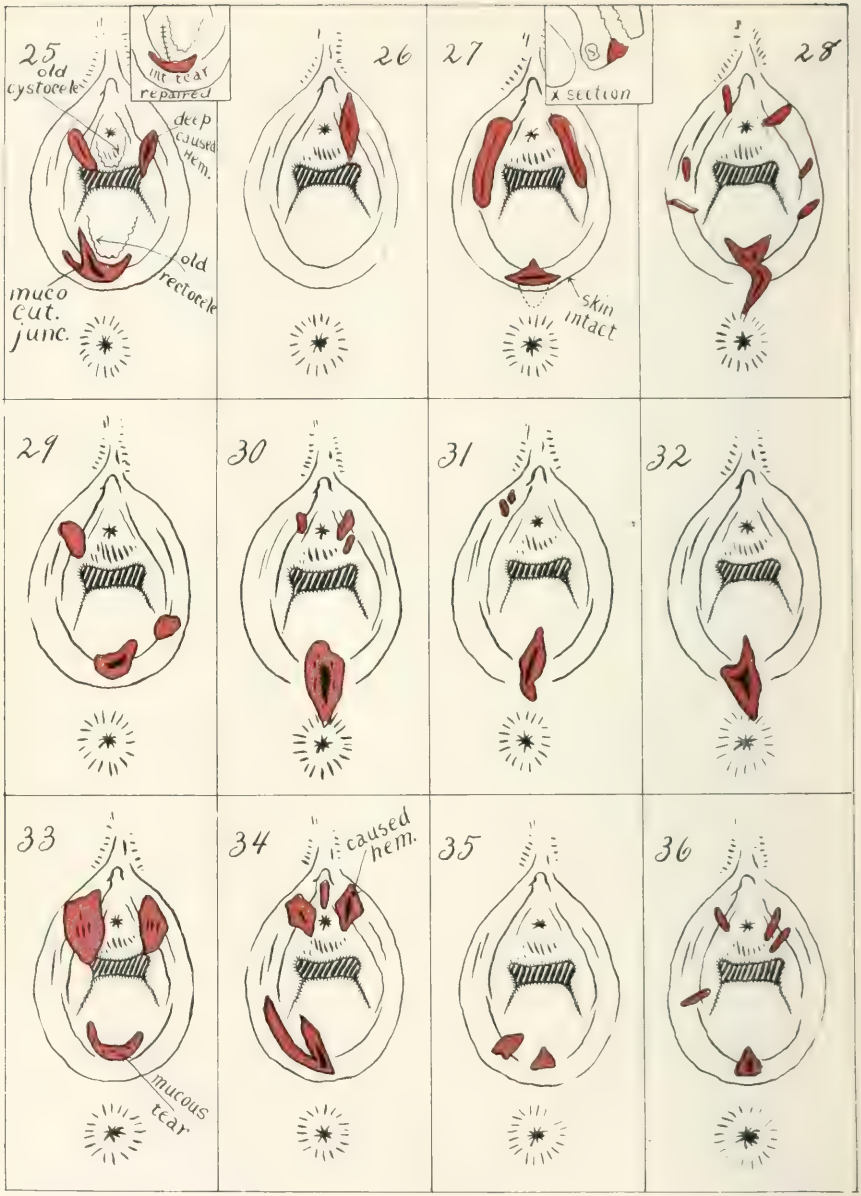
In breech deliveries the reverse must ensue, i. e. the occiput remain within the ring and pivot under the symphysis, allowing the sinciput to engage first in the ring.

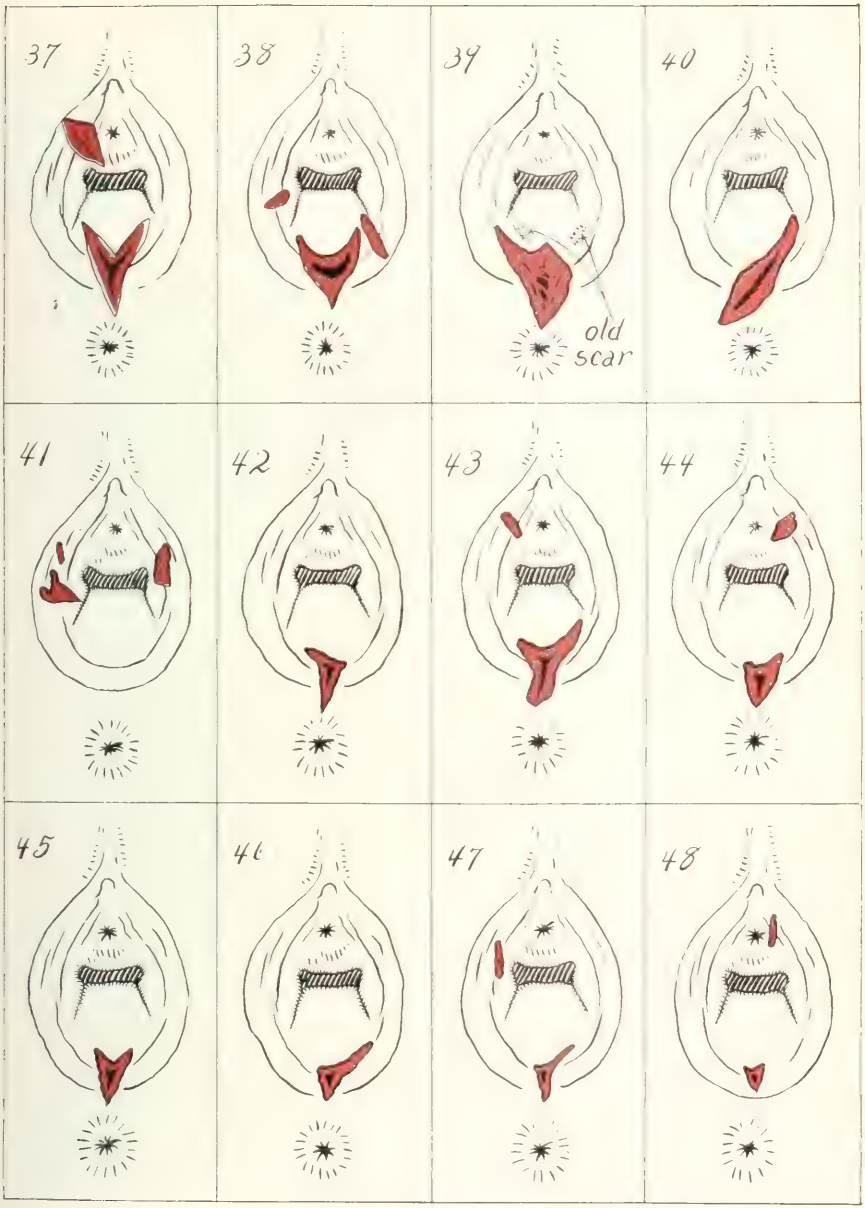
The use of forceps as a causative force is one which varies very much with the methods of different operators. The harm they cause depends upon — 1. The kind of forceps employed; and 2. Upon whether the operator delivers the head with the forceps or not.

Forceps with long blades of the type of the Simpson forceps may cause laceration of the perineum in two ways. First, directly on a backward pull by the breadth between the shanks where they join the handles, which unduly stretches and wounds the outlet at a level with its greatest frailty, the posterior fourchette. Second, the blades themselves do not closely approximate the fetal head, and the edge of the blade extending beyond the head, impinges upon the vaginal floor and is forced into the tissue. This condition is quite common when attempts are made to deliver the head through the ring without removing the forceps. When the handles of the forceps are turned upward in order to extend the head, the blades, not fitting snugly over the head, but grasping the parietal pro-


1
Urethra
Clitoris
labium majus
labium minus
vaginal vault
Int tear repaired
2
3
4
5
old scar tissue
6
7
Deep separation of muscles to skin in ischio-rectal space
8
old rectocele
9
Rectum
Vagina
section 9
10
superficial
Deep
11
12


13
14
15
16
17
18
19
20
21
22
23
24
L.M.
through labia minus
torn by shoulders
2nd degree
skin intact


25
old cystocele
int tear repaired
deep caused hem.
old rectocele
muco cut. junc.
26
27
x section
skin intact
28
29
30
31
32
33
mucous tear
34
caused hem.
35
36


37
38
39
old
scar
40
41
42
43
44
45
46
47
48

cesses firmly, turn upon these eminences as upon a pivot, with the result that the point of the blade extends beyond the head and impinges upon the pelvic floor. Further descent of the head drives the point into the tissue and starts a laceration. In such conditions it requires but a small beginning of a tear in the mucous membrane to result in a large laceration.

The secret of success in the prevention of perineal lacerations is to keep the mucous membrane intact: once the mucous membrane is ruptured, as by the point of the forceps' blade, the head stretching these tissues often causes a severe tear, while, if the mucous membrane is kept intact, delivery is often made successfully through most rigid perinea. In other words, the tissues are like cotton, in which, if a tear is once begun, it may be easily extended. Such was the result in one case (No. 7), here reported, where a small laceration was caused by the points of the Elliott forceps and the muscles split so that the finger could be thrust between the muscular planes to the skin of the ischiorectal space.

The secret of avoidance of tears in forceps delivery is the use of proper forceps and the removal of the forceps as soon as the head can be controlled by the hand.

The author has made trials by practical use of many models of forceps and has finally come to use solid blade forceps after the Tucker-MacLane model. These forceps fit the head well, cause little traumatism to the vagina and perineum, and are easily applied without causing abrasions or injury. The best types of these forceps are the Cragin and the McDonald models, made by Tiemann, New York. These forceps may be applied and the head drawn down until it can be controlled by pressure upon the forehead between the coccyx and the anus. No attempt should be made to deliver the head without first removing the forceps.

With the acquirement of skill and the use of proper forceps, there is no reason why there should be more lacerations directly due to forceps in instrumental deliveries than in non-instrumental deliveries. The head may be delivered as slowly and as much care taken of the perineum as in non-instrumental deliveries.

A frequent cause of perineal laceration which is often credited to the forceps operation is the traumatism done by the prolonged stay of the head at the outlet and the pressure caused by the ineffectual labor pains pressing the presenting part against the pelvic diaphragm. In those cases (Nos. 19, 30, and 38) in which the head had remained some time upon the pelvic floor, the resulting lacerations were extensive and deep; the tissues were edematous and fragile, being repaired with difficulty, as the sutures cut out. The presenting head should not be allowed to remain upon the perineum without advance for more than an hour and a half, and usually not that time.

Posterior positions are also often spoken of as a cause of perineal lacerations and undoubtedly predispose to this condition. Forceps rotation is dangerous with the old style long fenestrated forceps. The vaginal mucous membrane may be stripped off, as was the result in one case (No. 32), reported here. However, with the modern solid blade model, the operation of rotation by forceps is easy, and there is but little danger of damage to the mucous membrane.

Scar tissue in the perineal ring as a result of old wounds or previous perineorrhaphies makes the perineum more easily torn. The fibrous scar tissue has not the elasticity of normal perineal structure, and rupture is apt to occur at this spot. In several cases of multiparæ (Nos. 5, 8, and 39), the perineal outlet was of fair size, yet a laceration occurred at the site of the scar.

It is frequently stated that the shoulders in head presentations often cause lacerations of the perineum. Such is not my experience. I have never seen a laceration from the shoulders alone; but large shoulders quite frequently increase the extent of a tear which was begun by the head. The phenomenon already referred to holds good that a tear once begun readily extends: such was the result in one case (No. 18) in this series.

For the purpose of consideration of these lacerations, they may be divided into tears of the anterior and posterior part of the perineal outlet. The posterior tears may again be divided into — 1. Tears not involving the

muscle, or minor tears; 2. Tears involving the muscle, or major tears; and 3. Tears involving the sphincter.

The relation of the skin surface to the lacerations has no bearing upon its depth or gravity. Ofttimes a laceration may not involve the skin surface, yet extend deep into the muscle of the pelvic floor. Such cases are Nos. 7, 24, 27, and 36. There may be extensive injury to the pelvic muscular support without any rupture of skin surface.

Minor lacerations occurred 21 times. Forceps were done 4 times. The average weight of the babies, as before stated, was 3,310 grammes.

Major lacerations occurred 27 times. There were 11 forceps deliveries. The average weight of the babies was 3,550 grammes.

No cases of sphincter tear occurred in this series. The author has repaired a number of sphincter lacerations in obstetrical work and has had two occur in his own hands. One of these was due to an ill-directed and ill-controlled forceps traction when the head was near the perineum. The head came down suddenly with the last traction, and, as the direction of the traction was wrong, ruptured the perineum. The other case was one in which, while an assistant delivered a case of placenta prævia under my direction, the arms became extended in the breech extraction and caused delay, so that I was compelled on account of the safety of the child to extract the head very hurriedly. The head came through the pelvis so quickly that the extension of the face was not done. The chin caught against the perineum and caused a sphincter laceration. Both of these tears should have been prevented. Most sphincter lacerations are without excuse, and, with proper care, should not occur.

In a consideration of these 48 cases, it will be seen that lacerations of the anterior portion of the perineal ring have occurred 32 times. These lacerations occurred in the region of the vestibule, through the labia minora and around the urethral orifice. They frequently caused hemorrhage. In one case (No. 14) the labium minus was torn completely through, as if cut with scissors. These anterior tears have but seldom been referred to (save by Bar and

TABLE OF CASES

No.	Degree	Perineum	Occ. Fr.	Wt.	Remarks
1	I	Normal	12	3750	
2	I	normal	12	3300	
3	I	normal	11	3300	Precipitate. Age 39.
4	I	normal	11.25	3400	
5	II	sl. contr.	10.5	3000	Scar of old operation caused rigidity.
6	III	sl. contr.	11.75	3600	
7	I	normal	11.75	3450	Med. forceps. Muscle split begun by sharp edge of forceps.
8	II	normal	12	3500	Old scar tissue.
9	I	contracted	11.5	3200	High forceps; torn after removal.
10	I	contracted	11.75	3	High forceps, dry labor.
11	I	contracted	11.25	2850	
12	I	normal	10.5	3100	Low forceps.
13	I	normal	10.25	3000	
14	I	normal	10.50	2950	
15	I	normal	11.25	3400	
16	I	sl. contr.	10.75	2800	
17	I	normal	11.25	3000	
18	I	sl. contr.	10.50	3700	Tear increased by large shoulders.
19	I	normal	11.5	3200	R. O. P. Head on perineum 1½ hours, tissues contused.
20	I	normal	12	3750	
21	I	normal	10.75	3	Low forceps.
22	I	normal	12	4	
23	I	normal	11.5	3.15	
24	I	normal	11	2950	Second degree. Skin intact.
31	II	normal	10.75	3	R. O. P. Head came down quickly when membranes ruptured.
26	I	normal	11	3	
27	I	normal		3	R. O. P. Second degree. Skin intact.
28	III	contracted	10.5	3800	Med. forceps.
29	I	normal	11.5	3050	Low forceps.
30	I	sl. contr		3000	Head on perineum 1½ hours.
31	I	normal	11.25	3	
32	I	normal	11.25	3	Med. forceps. L. O. P. Caused by attempts at rotation.
33	I	normal	11	3	R. O. P. Low forceps, age 44.
34	I	normal	10.30	3500	Very rigid.
35	I	normal	11	2650	
36	I	sl. contr.	10.75	2	
37	II	normal	11.5	3	Med. forceps. Dry labor.
38	I	normal	11	3	Low forceps. Head on perineum 1½ hours.
39	II	normal	11.5	3800	Low forceps. Old scar of previous repair.
40	I	normal	11.25	3	Med. forceps.
41	I	normal	12	3	
42	I	normal	11.75	3250	
43	I	normal	11.50	3400	Med. forceps.
44	I	normal	11.5	3500	
45	I	sl. contr.	11.25	3400	
46	I	normal	11.25	3	
47	I	normal	11	3000	
48	I	normal	11.25	3200	

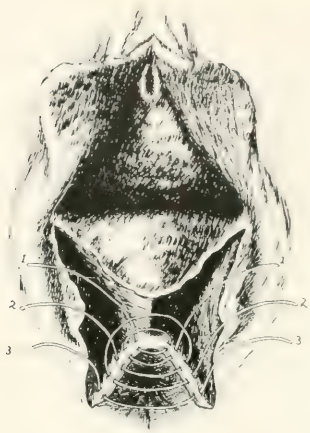


Fig. 5.

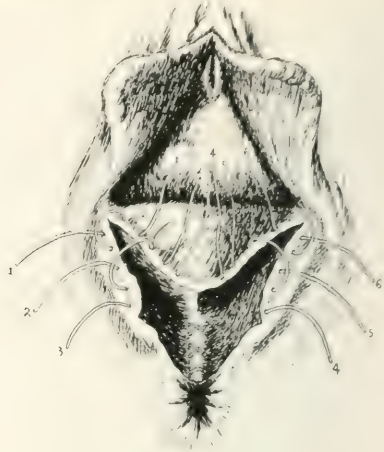


Fig. 6.

Hirst) and are of considerable importance, as they often bleed profusely.

A scrutiny of the more severe tears of this series will show that the lacerations are usually lateral. Those which occurred in the midline did not extend centrally up the vagina, but deviate to one or other side, or separate to form a Y. The only lacerations which extended centrally up the vagina were those in which the perineum was the seat of old scar tissue which altered the normal relation of the fibers.

Thus it will be seen that any secondary operation which considers purely the middle line of the vagina does not attempt to repair the original trouble and is ineffectual in restoring the parts to their previous condition. The Emmet operation, as modified by Noble, best completes the exact anatomic restoration. It may be modified to suit any of the more severe lacerations shown in these pictures.

These lacerations were all repaired immediately after labor. The operation may be delayed 24 to 28 hours, if the woman's condition is poor, but should not be delayed longer, as the pyogenic organisms, constantly in the lochia, may cause infection of the wound. If it is necessary to delay longer, the laceration should be left for complete cicatrization, and a secondary operation done. The intermediate operation in the stage of granulation is one fraught with danger. Freshening the granulating surfaces of an infected wound of the perineum may cause a severe intoxication and open avenues of infection.

The technique of the operation was as follows: First, if there was a sphincter tear, the rectum was sutured by a modified Lauenstein suture with fine chromic catgut and a small needle. These sutures pass in and out close to the margin of the gut upon the vaginal side without penetrating the rectal mucosa. They are introduced in a figure-of-eight and tied not overtightly. The remainder of the operation, save for joining the sphincter ends, is the same as for a sphincter or major tear.

The mucous membrane is sutured with No. 2 chromic catgut, with a Kelly's needle. These needles should be rather heavy; a useful type, with a large (Lister's) eye in the side, is that sold by Codman and Shurtleff of Boston. The needle should be inserted 1 cm. from the edge of the mucous membrane and come out at the bottom of the laceration; be reinserted and emerge 1 cm. from the opposite edge (Fig. 6). Full bites of tissue should be taken.

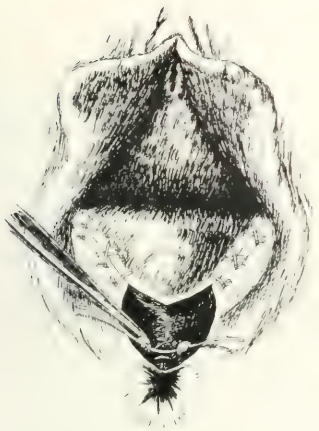


Fig. 7

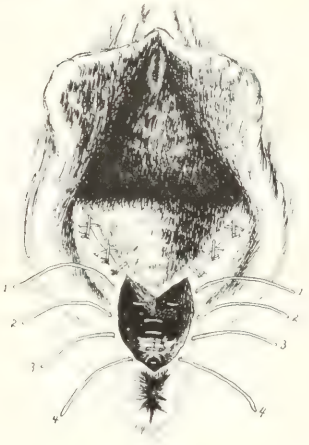


Fig. 8

The sutures here are also passed as figure-of-eight. These double stitches save time, lessen the possibility of infection along the suture line and properly coaptate the parts. Care should be taken that the sutures completely close the sulci and do not connect them into closed gutters for the passage of discharges.

Twelve-day chromic gut is used and lasts in the vagina from six to ten days. Plain catgut is not of use in the soft succulent tissues of the postpartum passages, as it is absorbed too rapidly. No. 3 plain catgut lasts on an average three days under these conditions.

If the laceration is complete, the sphincter is now brought together by two sutures of No. 1 chromic catgut on a small needle. These sutures are buried (Fig. 7).

The next step in the operation is the closure of the external or skin surface of the laceration: this is done by silkworm gut sutures, with the Kelly needle. The sutures, as passed through one side of the wound, come out at the bottom and, if necessary, pick up any redundant tissue, and are reinserted to come out about 1 cm. from the skin surface. These sutures are drawn sufficiently tight, to bring the edges of the wound firmly together. It usually requires from three to five of these sutures. None should be tied until all are in place, the effect of each suture upon the wound by crossing the ends of the suture being to pull the edges of the wound together. When all are inserted, these sutures are tied.

Attention is then directed to the mucocutaneous junction at the level of the hymen. Here two or three fine chromic sutures are usually required, to effectually seal the wound.

The secret of success and primary union in this operation is to have no opening or gap in the line of the wound for the entrance of the lochial discharges which have been proved always to contain pyogenic organisms. These last chromic gut stitches effectually block a very commonly left gap which would permit the infiltrating discharge to obtain entrance to the lower part of the wound. These stitches correspond to the "crown-stitch" of Emmet's operation and restore the fascia in that plane as well as add to the cosmetic result.

The operation is done in three steps: 1. Suturing the mucous membrane; 2. Suturing the external tear; and 3. The "crown-stitches."

The anterior lacerations were all repaired with fine plain catgut. The tissues here are not so succulent, nor are they so exposed to discharges, as to require chromic gut. The difficulty in the repair of these anterior tears is to avoid puckering and to get a straight line of

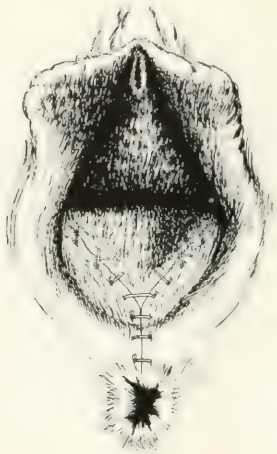


Fig. 9.

union. This is best done by beginning the continuous suture at one end of the tear and tying it. This tied end is used as a tractor and the suture continued as a "half-hitch" suture, i. e., after every bite of the needle the catgut is passed underneath the last stitch, as the tops of flourbags or bales are sewn. The suture is thus continued to the end, leaving a straight wound.

All these cases healed up by primary intention. One, in which plain catgut was used, had some separation and infection of the vaginal part of the wound. The sphincter tears, sutured by this method, and with fine chromic gut buried in the sphincter muscle, healed perfectly.

The aftercare consisted in keeping the women in bed for ten days. No douches were given, except on other indications. The silkworm gut sutures were removed in from ten to fourteen days, as the condition of the wound demanded. The women were often allowed up after ten days with the sutures in place, and about the house a day or so before their removal.

REFERENCES

1. Gynæciorum hoc est de Mulierum tum Aliis tum Gravidarum, etc. Basileæ per T. Guarinum. 1566–257, chapter xx. Gynæciorum sive de mulierum affectibus commentarii Græcorum etc. Basileæ 1586, vol. i, chapter xx, p. 105. Quoted by Kelly-Noble.
2. Ambroise Paré. Opera Ambrosii Parei regis primarii et Pariensis chirurgi, etc. Parisiis. J. Dupuys, 1582. Liber xviii, chapter xxvii, p. 698. Ibid. "The Workes of that famous Chirurgien Ambroise Paré, translated out of the Latin and compared with the French by Th. Johnson," etc. London: R. Cates, 1649. Liber xxiv, chapter xxvii, p. 615. Quoted by Kelly-Noble.
3. Guillemeau, J. Les Oeuvres de Chirurgie, etc. Paris: N. Buon, 1612. Livre iii, chap. vii, p. 354. Quoted by Kelly-Noble.
4. Dieffenbach, J. F. Chirurgische Erfahrungen, 1829, bd. i, p. 64. Sur la rupture de Périnée. Jour. Complementaire au Dictionnaire de Science Médicale, 1830, xxxviii, pp. 193-206. Ueber die Zerreissung des Dammes bei Frauen, Medicinische Zeitung, 1837, bd. vi, p. 255
5. Mettauer, John P. A Case of Laceration of the Perineum. American Journal of the Medical Sciences, 1833, vol. xiii, p 113.
6. Roux. Mémoir sur la restauration du Périnée, etc. Gazette Méd. de Paris, 1834. Tome ii, p. 17.
7. Ibid. Clinique chirurgicale. L'Union Médicale, 1849, vol. iii, p. 247.
8. Bayer, W. Cases of Ruptured Perineum treated successfully. Edinb. Med. and Surg. Jour., 1823, vol. xix, pp. 551–554.
9. Churchill, J. M. Case of Lacerated Perineum. London Med. Repository, 1824, vol. i, pp. 464–468.
10. Williams, C. Case of Laceration of the Perineum. London Med. and Physic. Jour., 1827, vol. iii, pp. 101–102.
11. Alcock, Thos. On the Treatment of Laceration of the Perineum in Parturition. London Med. and Physic. Jour., 1820, vol. xliv, pp. 193–197.
12. Fricke, J. C. G. Episorrhaphie ou nouvelle opération pour la cure de prolapsus de la matrice. Gaz. Méd., 1835. Tome iii, p. 249.
13. Nick. Beobachtung der vollkommenen Heilung einer noch ganz neuen Dammruptur. Med. Correspondenzblatt des Württembergischen Aerztevereins, Stuttgart, 1838, bd. viii, p. 301.
14. Brown, I. Baker. Diseases of Women, 1854. On Rupture of the Perineum and its Treatment, etc., 1855.
15. Savage, Henry. The Surgery. Surgical Pathology and Surgical Anatomy of the Female Pelvic Organs, 1870. London, sec. ed.
16. Emmet, T. Addis. A Study of the Etiology of Perineal Laceration with a new method for its proper repair. Transact. Amer. Gynec. Soc., 1883, p. 198
17. Williams, quoted by Hinchey. Surgery, Gynecology and Obstetrics, 1907, 155.
18. McDonald, Ellice. Mensuration of the Child in the Uterus with new Methods. J. A. M. A., 1900, Dec. 15

JOHN B. DEAVER, M.D.

DEPARTMENT OF
NICHOLAS SENN FESTSCHRIFT

THE MEDICAL AND SURGICAL TREATMENT OF GALL STONES, THEIR SCOPE AND RELATIONS

BY JOHN B. DEAVER, M.D., Phila. [illegible] P[illegible]

INTRODUCTORY

WE meet to night to do honor to one of the pioneers of American Surgery. Dr. Senn has always been in the forefront of his chosen profession. *He* has shown the way, others have followed. The wide range of his labors is shown in his numerous and valuable contributions to the literature of surgery. His text-books still remain classics, his articles have always shown close observation and clear reasoning.

The most widely separated fields of practical and experimental research he has made his own. The surgery of the intestines and the pancreas engaged his attention at a time when the technic of intra-abdominal operations was in its infancy. His studies on tumors and tumor formation began more than twenty years ago and still challenge our attention. At the same time, Dr. Senn did not neglect other branches of surgery and medicine. Traumatisms and inflammations of bones, and the tuberculous process in all parts of the body engaged much of his time as a practical surgeon and clinician, while his experimental researches on air embolism and the cicatrization of blood-vessels testify to his interest in the more theoretical studies, of which he has always been an ardent defender.

Following a notable series of monographs come Dr. Senn's larger works. The high standard which he has set for himself has not been lowered in these, and they also will remain enduring monuments to his fame.

And with all this work Dr. Senn has found time to give us a series of medical travel pictures almost unique. His journeys have taken him to Europe, to the Arctic regions and to the Tropics. They have taken him to the quiet of far-off islands and to the turmoil of war in Cuba and Mexico. And on each occasion the medical world has been enriched by the thoughts and impressions of a most observant traveller, written in a style which holds attention and compels understanding.

It is by such labors as these that Dr. Senn has contributed much, not only to our fund of knowledge, but also to our breadth of view. And it will be my endeavor this evening to follow in some measure his footsteps, by attempting to smooth some of the difficulties of a much misunderstood subject, misunderstood generally, not because of ignorance, but because of narrowness of view. It is:

THE MEDICAL AND SURGICAL TREATMENT OF GALL STONES, THEIR SCOPE AND RELATIONS

The rise of surgery in the last two decades has brought many conditions, formerly left to the internist alone, into the sphere of surgery. Some, such as appendicitis and carcinoma of the gastro-intestinal tract, are by common consent ailments of a purely surgical character. Others are still upon the border- ine.

Of the latter class, cholelithiasis is perhaps one of the most conspicuous examples. While the ideal treatment of gall stones is undoubtedly by surgical procedure, it would be folly to assert that all cases should be subjected to such treatment without delay.

Internists and surgeons have indulged in many bitter arguments and discussions on this score, each failing to realize that both have places to fill. The work of the one must supplement and at the same time be guided by that of the other. It is often only by careful observation and discrimination in individual cases that a choice can be made between the two modes of therapy; and an adequate comprehension of the relations of medical and surgical treatment of gall stones lies at the bottom of a sensible use of either.

One of the great strides in an understanding of gall stones brought about by modern surgery has been in the demonstration of the living pathology. While clinicians have been studying the symptomatology, and pathologists have carefully investigated the gross and minute pathology in the cadaver, the surgeon alone is able to show the disease in all the stages of its progress. He sees it in its incipiency in one case,— when it has progressed somewhat further in another;— and again in a third he sees it when it has nearly reached a fatal termination. The latter condition, thanks to enlightened medicine and surgery, is daily becoming rarer and rarer, and were operative treatment promptly resorted to, need scarcely exist at all.

Consequently it is the surgeon first and foremost who is privileged to appreciate what grave lesions and pathological processes may exist with few marked symptoms, and even these may be masked until the time when they will show their effect so quickly that no form of treatment will be of avail. He is able to see more clearly than the physician how the complications of gall stones — adhesions, cholecystitis, pancreatitis, etc.,— make difficult the diagnosis and retard the treatment. It is the surgeon again who shows how often gall stones are present and underlie the symptoms when their presence can scarcely be suspected, and he it is who often demonstrates that cases

formerly given up in despair of diagnosis, have as foundations of their illness either gall stones or their common accompaniment, adhesions of the upper abdomen.

Such conditions as these would naturally lead us to restrict the field of medicine and enlarge that of surgery in gall-stone disease; yet surgical treatment is by no means to be insisted upon for all patients. It has been well said by Kocher that gall stones do not "belong" to the surgeon. "They belong," he says, "in the first place to the patient and if he prefers to retain them and to drink Carlsbad waters as well, he is quite within his rights to adopt this method, a line of treatment which, as is well known, is followed even by many surgeons when they themselves have gall stones. In the same way, if a patient prefers to wait in suffering and pain for a stone to work its way down *per vias naturales*, he is but enjoying his personal privileges. But," as Kocher adds, "at the present day the surgeon is certainly justified in telling a patient with gall stones that by an operation he can be quickly and safely cured of his trouble and be saved from eventual danger, more rapidly and more easily than by any other treatment."

There are, in the first place, many cases in which a patient has but one or at most two attacks of gall-stone colic in a lifetime, and in the interval is perfectly well. Medical treatment and hygienic watchfulness meet all demands in this class of cases; but at any moment acute symptoms may arise demanding immediate operation, and then both patient and surgeon will realize, perhaps too late, the greater safety and efficacy of operation in the interval between attacks.

Then again, many patients urgently in need of radical relief show contraindications to surgical intervention. Thus, persons who are markedly anemic or cholemic, who are very old, or who have some grave lesion of the heart, lungs or kidneys, should be operated on only as a last resort, if at all.

Many also in whom surgery is indicated refuse for personal or extraneous reasons to consent to operation. Such cases as these are entitled to medical treatment, though the surgeon should not conceal from them the added risk they run in postponing radical cure.

The medical treatment of gall-stone disease I will not discuss at length. It must aim to reduce inflammation of the gastro-intestinal tract, to favor elimination of toxins, and to guard against dietary and other indiscretions which cause exacerbation of the symptoms. This is the rationale, or rather what is accomplished in selected cases by the Carlsbad treatment, as carried out at these celebrated Springs. It must not be understood that the Carlsbad waters or the Carlsbad treatment dissolves stones or forces them through the bile passages, for such is not the case. Many people who take the journey to Carlsbad are not suitable subjects for this treatment, the consequence is that much of my time is occupied by operating on patients who have received this treatment with no results. The journey to Carlsbad is expensive and can only be entertained by those whose financial conditions permit it; therefore, he

who has to earn his bread by the sweat of his brow must submit to the aseptic scalpel of the surgeon if he would obtain a cure. I have never had any evidence that the medical treatment in these cases is anything but palliative. The cure of gall stones by medication or the relief of their complications by drugs is, for the present at least, an impossibility. Reported cases of cures are generally found to be instances in which the stones have become quiescent, but have not been removed. Dr. A. O. J. Kelley, in studying 216 patients recently operated on by me for infections of the biliary tract, said (Amer. Jour. Med. Sc., Nov., 1906): "We now know that the thousands of gall stones said to have been passed by the bowel after the administration of olive oil are merely masses resembling gall stones in outward appearance, and due to the basely deceptive powers of the olive oil acquired in its passage through the intestinal tract."

There is no doubt that much can be done by medical means to build up the patient, reduce the effects of cholemia and prevent recurrence of attacks of colic, not to mention relief of acute pain. But that gall stones can be broken up, dissolved, removed, or otherwise done away with by drugs, seems to me an idle statement in view of the modern understanding of their nature and pathology. And especially unaffected by medical treatment must always remain the graver complications of gall stones, such as empyema of the gall bladder, adhesions, fistulae, etc. It must not be lost sight of that gall-stone disease can remain latent until Nature places the patient asleep in the everlasting rest of the grave. Granting then, that surgery is the preferable treatment in most cases, there is still the distinction between those in which the operation is one of immediate necessity, and those in which it is one of choice. In the former group we may include primarily cases in which we have marked infection, with cholangitis, or with empyema of the gall bladder, and those cases of obstruction of the common duct which show no tendency towards amelioration of the symptoms after a reasonable time of treatment — which I consider to be from two to three weeks.

In the latter class are cases of simple hydrops of the gall bladder, and ordinary cases of cholelithiasis in which the attacks are separated by longer or shorter periods of good health.

So also are those doubtful cases in which a diagnosis rests between one of gall-stone disease and a duodenal or gastric lesion. A realization of the number of cases in which prolonged indigestion of a more or less marked type, continued flatulence and vague epigastric distress and pain are due to gall stones or their sequels, has only of late years become more common. First and foremost among these sequels we must count adhesions of the upper abdomen as a result of gall stones. These impinge upon the neighboring viscera, the stomach and duodenum especially, and give rise to symptoms none the less annoying because they are vague and varying in character. Indeed, it is often the pericholecystic adhesions that give rise to the symptoms of which the gall-stone patient most bitterly complains. Bland-Sutton (Gall Stones and Bile

Ducts, N. Y., 1907, p. 192) narrates that on two occasions where he has removed calculi from gall bladders he was unable to see the liver on account of adhesions.

The prevalence of "indigestion" and "dyspepsia" in gall-stone patients is shown by the fact that in a series of 182 consecutive cases of my own which I have recently analyzed, they were noted in more than forty per cent of the total number.

When surgical intervention has been decided upon for the relief of one or another of the conditions mentioned, we can undertake it with much better spirit and hope of success than would have been possible fifteen or even ten years ago. In hardly any other branch of abdominal surgery has the recent progress been so rapid and at the same time of so definite and lasting a character as in the technic of operations upon the gall bladder and biliary passages.

Needless to say that the patient should be in the best possible condition when the operation is to be performed. Three days of preparation and stimulation where it is needed will often save as many weeks of anxiety after the operation, and will preserve many lives. The circulation should be in the best possible condition, and the excretory organs doing the best work of which they are capable. Anemia should be combated, and delayed coagulation dealt with as far as it can be by the agents which we have at our disposal. In the latter condition the chloride and lactate of calcium have been recommended. I have used them both, but am still very doubtful whether or not they have any real value.

Before the operation itself begins, and during its progress, the anesthetist fully shares the responsibility of the surgeon. Careful anesthesia is of the utmost importance, especially in operations so prolonged as those in complicated gall-stone cases are apt to be.

When the operation itself is considered, there are a number of points to which the surgeon must direct his attention.

1. The incision. In spite of the dictum of so accomplished a surgeon as Terrier, that Mayo Robson's incision is "not sufficient", it is that which I prefer, if any departure from the simple straight incision is demanded. I have never found fuller exposure than it gives, requisite. The use of a sand pillow or some similar support beneath the spine, so as to increase the dorso-lumbar convexity, as first suggested by Elliot of Boston, is indispensable in most operations on the bile ducts. In very difficult cases the reversed Trendelenburg position may be a further aid in rendering accessible the deeper parts of the common duct or the hepaticus.

2. The field of operation when exposed must be carefully walled off from the abdominal cavity at large, to prevent the distribution of possibly infectious material in the peritoneal cavity. I use for this purpose both gauze pads and marine sponges. The former I introduce first, and the sponges above it. The sponges are of advantage in a twofold way: (*a*) They absorb the bile or fluid

rapidly and hold it well. (*b*) By their elasticity they may be made to act as retractors, especially when held by the hand of an assistant. The operation is much accelerated by introducing packs where they are to remain until the close of the operation. Many surgeons will have to remove their packs several times and again reinsert them, before they are able to obtain sufficient exposure in the depths of the wound. This is usually due to carelessness, and to neglect of the surgical principle of beginning the insertion of the pads from one extremity of the incision. If the first pad be placed in the middle of the incision, the intestines will prolapse on both sides of it, and before a second pad can be placed the first will have become useless.

3. Adhesions must be dealt with and removed when they mask the field of operation, obstruct the biliary passages, or interfere with surrounding organs. They should be left alone when they are doing no damage, as their removal always takes time, and prolongs the operation, and may lead to consequences more grave than those to which their presence gives rise.

4. All the stones present in any one of the bile passages must be removed, unless they are far within the hepatic ducts and cannot be reached. A stone left in the gall bladder becomes a fresh focus of stone formation, while a small fragment in the ampulla or common duct of course invalidates the whole operation.

5. The gall bladder should be left when it is not so much damaged as to be functionally inactive as a bile reservoir, but must be removed when the contrary is the case.

6. After an operation on the gall bladder or bile passages, drainage should always be instituted in the presence of infection, and also in the majority of cases even when no infection is present. This renders the operation much more safe, and lessens the chance of subsequent complication. To me it is incomprehensible that surgeons should regard drainage of the hepatic duct through the common duct into the duodenum as sufficient in cases of infectious cholangitis. To drain one infected organ into another — the duodenum — I consider unsurgical in the extreme. In cases of severe pyelo-nephritis we are not satisfied with the drainage afforded through the ureter, into the bladder, which was probably the original seat of the disease — but we perform nephrotomy, and drain the kidney directly into the loin. So when the liver is infected, and we have a suppurative cholangitis, the only chance of safety lies in direct hepatic drainage through the laparotomy wound. The intra-hepatic pressure must be relieved, and this can not satisfactorily be done by drainage into the intestinal tract.

7. After removal of the gall bladder in the presence of infection there should always be some chance for the drainage of bile, either by draining the stump of the cysticus, or preferably the hepaticus through the common duct, by means of a rubber tube. When there is no such infection, and the gall bladder has been removed, a cigarrette drain should be introduced to the site of the ligature on the duct, to guard against infection should the ligature slip or be thrown off by the *vis a tergo*.

8. There should be as little disturbance of the peritoneum as possible. If there is much trauma to this delicate membrane adhesions are sure to result. This must be borne in mind especially when introducing gauze drains. These, when used in the conditions under discussion, should always be covered with rubber dam or introduced through a split rubber drainage tube to prevent their sticking and forming adhesions.

This is but a brief outline of some of the cardinal principles underlying gall bladder surgery. Only those who do it can appreciate its difficulties and dangers, and no branch of surgery is less suitable for the tyro. The surgeon who does gall-stone operations must be prepared to do a gastro-enterostomy, or an entero-enterostomy,— in fact, must be ready for almost any abdominal operation. Complications are often found to exist which tax the skill of any surgeon, and the avoidance of danger to surrounding organs or spreading infection is no easy matter.

The surgical treatment is by no means ended when the patient leaves the operating table. The after treatment is in most cases simple. The patient is left alone and recovers. Stimulants may at times be needed, and their nature and indication will be evident. The drainage must be left in an adequate time — until it has fulfilled its function and can be removed easily.

Perhaps the most common post-operative condition that calls for prompt treatment is persistent vomiting. Early and often repeated lavage is its only treatment, and practically never fails to give relief.

The results of surgical treatment of gall-stones are universally acknowledged to be highly satisfactory. In no other branch of abdominal surgery is a final and permanent recovery more sure to follow operation. In a series of 182 cases of gall-stones, operated upon by me in the last few years, I have had a general mortality of 14.8 per cent. This includes besides simple cases, — carcinoma, cholangitis, purulent cholecystitis, perforation of the gall bladder and local peritonitis. In selected cases the mortality is of course less. My later cases give a much lower percentage of mortality than the earlier ones, the improvement in the death rate going hand in hand with the improvement in technique and more careful selection of cases.

Much would be gained if the cases came to the surgeon earlier, when gall-stones alone had to be dealt with and not their complications. The complications cause the operative failures and raise the mortality. Sepsis and infection before and at the time of operation have caused nearly half of the deaths in my cases.

It is evident then, that if the cases are sent to the surgeon in due time, and operated upon only when they are in suitable condition, few failures will follow proper surgery.

Medicine and Surgery must go hand in hand in the treatment of gall-stones, each treating a separate class of cases, and always bearing in mind the fact that a surgical cure is the only final and definite one.

DEPARTMENT OF TECHNIQUE

EXCISION OF THE KNEE-JOINT[1]

By ALEXANDER HUGH FERGUSON, M.D., Chicago

The subject of excision of the knee-joint is very extensive. So much has been written regarding it, that to make any attempt to cover the literature would consume more time than is allotted to me this evening. Therefore, instead of going exhaustively into the literature of the subject and giving you information which can be gleaned from text-books, I will describe to you how I prefer to perform an excision of the knee-joint.

As you are well aware, the evolution of this operation has passed through as many stages of commendation and opposition as probably any other operation that has become established. While it was attempted in 1761, it was not deliberately performed until 1781. Nothing further was done for about sixty-nine years, until Sir William Fergusson, in 1850, revived the operation and put it on a surgical basis. Of course, this was in pre-antiseptic days, when, as you know, the mortality was high on account of sepsis alone, to say nothing of the deaths that followed operation on advanced cases or those that had been abandoned as hopeless by all other methods of treatment.

The mortality attending the operation even at the time of Sir William Fergusson was about fifty per cent, and many years elapsed before any other surgeon would follow him. Gradually, however, a few French, German, English, and many of the foremost American surgeons took up the operation of excision of the knee-joint. Not, however, until the time of Lister, when the dangers from sepsis could practically be excluded, did the operation become the operation of choice in cases of chronic tuberculous disease.

Twenty years ago the operation was probably practiced most, and more excisions of this joint were performed then in our large hospitals in the space of a month than are performed to-day in a year or more. The advance and improvement in orthopedic treatment, mechanical appliances, the favorable changes in surgical technic, the partial resections and intra-articular medication, have all contributed wonderfully to reduce the number of excisions of the knee-joint. Then, too, excision passed through that stage when it was tried for everything else as well as for struma of the knee-joint. The time was when a slight injury of this joint was considered almost as fatal as a puncture of the peritoneal cavity. I remember in my early student days of seeing several patients die from a slight injury to the knee-joint. So fearful were surgeons of performing this operation in the early days, that excision was only practiced by the most fearless surgeons. But Langenbeck, Hoffmann, Fergusson, MacKenzie, Kohn, Macewen, Ollier, Fenwick (of Montreal), Kocher, and a number of other surgeons have taken part in establishing the operation of excision of the knee-joint as we perform it now.

The operation is no longer primarily considered in connection with ordinary gunshot wounds. It is no longer thought of during the primary invasion of tuberculosis, where only a limited amount of the structures of the joint are involved by that disease. The early excision for tuberculosis never reached the same prominence that excision of the hip-joint did. Eighteen or twenty years ago the former was popularized by Macewen more than by any other surgeon. To-day we may say that traumatism, early inflammatory changes (tuberculous or otherwise), conditions of flail joint, and those nervous conditions arising in children which affect the knee-joint, are no longer treated by excision. That limits the indications for excision of the knee-joint practically to the adult, and principally to the tuberculous conditions. I mean that form of excision which has for its object permanent bony ankylosis. Recently, however, some surgeons, myself among them, have in a few cases attacked firm, fibrous, or bony ankylosis of the knee-joint with the view of getting motion by shortening the limb somewhat and by placing some mature fibrous structure between the ends of the bones forming the joint. This operation is known in surgery as arthroplasty.

In performing excision we have two objects in view: one, the object of producing bony ankylosis, and the other of securing a certain amount of motion.

There is one thing which should be remembered

[1] Read before the Chicago Medical Society, June, 1907.

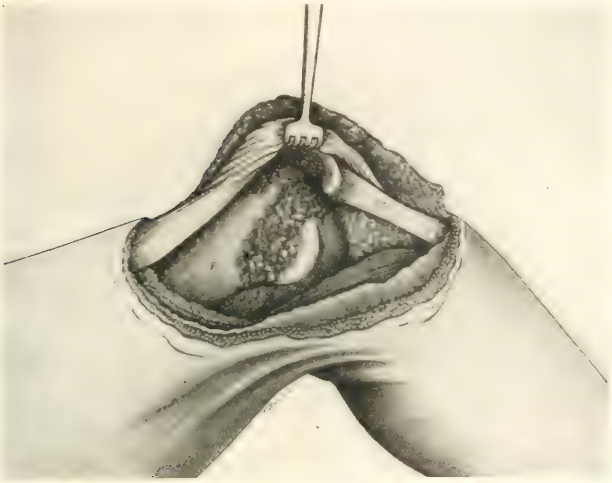


Fig. 1. External semilunar incision. P, Patella. P. T. Patellar tendon. F, Femur.

and that is, that no joint should be excised that is the seat of a mixed infection. If an adult has a stiff joint, one that is a hindrance to him in his locomotion, the limb may be shortened an inch or an inch and a half. Then the patient will be able to swing the limb when he raises himself on the opposite foot without encountering objects on the ground. A short limb, one that is stiff, is more useful than a long one that is stiff. Nature provides for this in children. The development of the limb that is tuberculous does not take place in the same proportion and extent as it does in the sound limb.

With this short introduction to the subject, I will describe briefly the method which I prefer in dealing with the knee-joint.

First of all, I prefer to employ an external lateral or longitudinal curvilinear incision, beginning a little below the tip of the tibial tubercle, extending downward and backward, curving forward and upward to the center of the thigh to a point opposite the limitations of the suprapatellar synovial pouch, under the quadriceps extensor. The knife with which the incision is made through the skin is discarded. It has done its work. It is probably smeared with germs from the sebaceous glands and hair follicles in the skin. Another knife is now taken, and with it I cut through the other structures in the same line until the synovial membrane is reached, cutting to the synovial membrane but not through it. This wound is then rendered antiseptic by the application of carbolic acid or Harrington's solution so as to prevent the implantation of tubercle bacilli on the raw surface when it is opened up. Then the joint is opened boldly in the same line. The next procedure is to take a sharp hook and place it at the outer edge of the patella and turn the flap forcibly to the inside of the leg. One may meet with some resistance on the part of the patellar tendon, or from the sheath of the quadriceps extensor muscle, but nicking these structures is sufficient. Having done that, I forcibly flex the knee-joint, the leg on the thigh, so as fully to expose the entire inside of the joint for inspection and manipulation.

The next step in the technic is to guard against the spreading of infection that is inside the joint to new raw surfaces which we make when removing the diseased structures. In order to avoid this, we can take some gauze, soaked in an antiseptic solution, and disinfect the surface of the diseased structure inside of the joint before commencing to dissect out the diseased synovial membrane. I begin to remove the diseased synovial membrane from its upper limitations by careful and clean dissection, and as soon as I strike a new focus, I at once disinfect it. At one time I employed irrigation during all this work. Now, I disinfect

Fig. 2. External semilunar incision. C.L. Crucial ligament. P. Patella. P.T. Patellar tendon. S.C. Semilunar. Q.T. Quadriceps tendon. T. Tibia cartilage.

at once, take another knife, and start behind the focus until I find I am getting into a normal plane outside of the diseased structures, and sweep everything down until I come to the attachment of the synovial membrane to the cartilaginous structure at the upper portion of the knee-joint, extending that to the sides as well. Then, I begin below and liberate the head of the tibia to a line where I want to saw the bone, without interfering with the intra-articular structures. To interfere with these would be to soil one's hands, to soil the instruments, and get into septic territory.

The next step in the operation is to saw through the bones. I prefer to saw through the head of the femur in a curved line (Fenwick), retaining, eventually, the normal contour of the head of the femur. The bone being sawed in this manner, I then aim at sawing the head of the tibia in the opposite direction, curving the cut out so as to have the concavity upward. It is not easy to do that with a Butcher saw or any other kind of saw. Take a saw and cut the end of the tibia square through first, and then curve out the head of the bone with a Butcher saw. The cartilages and the soft structures within the joint are now in two flaps, one from the head of the tibia, the other from the head of the femur. These are raised together and dissected away, taking care not to cut through the posterior ligament of the knee-joint.

This being done, there may be some little fitting to do, but after removing the two flaps, including the greater portion of the diseased tissue or all of it, we must look in two directions for diverticula. The diseased synovial membrane in a large percentage of cases dips behind the tibia, sometimes to the extent of an inch or two, and another pouch extends toward the head of the fibula. These must be dissected out. If, now, after taking off the head of the femur, there is extension of the disease into one or both condyles, use a Volkmann spoon, and remove all the diseased bone. Then the question arises whether it is better to resect the bone higher up or to drain the cavity or cavities made with the Volkmann spoon. This should be left to the judgment of the surgeon, who must be influenced in his decision by the age of the patient. If we have to perform an operation on a patient who is growing, which we do not do very often, the removal, say, of the head of the femur or tibia beyond the epiphyseal line should not be considered for a moment. Consequently all the cavities that have been gouged out of the bones must be drained. In adults, however, it is often more practicable to cut squarely through the head of the femur and tibia. The method devised by Fenwick of sawing and fitting the bones together prevents one result which so frequently takes place, namely, a forward sliding of the head of the femur over the head of the tibia. I am very fond of using nails, even when I have sawed the ends of the bones in a concavo-convex manner, for then I feel certain that the bones will stay in place.

Drainage after excision of the knee is, in my opinion, imperative. Drainage with silkworm gut is sufficient in the vast majority of cases. Several strands of the silkworm gut are passed immediately underneath the bone. I not infrequently pass a smaller drain upward to the large quadriceps extensor muscle. Then, before closing the incision completely, I inject an ounce of iodoform emulsion into the joint and apply a dressing. I prefer to rest the limb for the first few days in the half-box splint devised by Macewen. It keeps the limb and foot in the proper position; it extends up to the axilla, and the half-portion of the box goes underneath and supports the entire lower extremity and fixes all the joint. A point brought out by Langenbeck, Volkmann, and a number of other surgeons is that it is better to raise the popliteal space a little, so as to have the limb in the position of slight flexion rather than perfectly straight, on account of the tendency of the limb eventually to become bent backward at the knee-joint. Plaster-of-paris may be afterward applied. However, it does not make much difference what permanent

application is used, provided union has taken place. The foot should not be allowed to flop down sideways, for the reason that it remains there a considerable length of time, and it takes several months for the patient to overcome the eversion of the entire limb. If this eversion can be prevented or overcome, the patient can walk like the ordinary man. The reason for that is that the structures around the knee-joint become accustomed to a passive condition for several weeks, and therefore the activity to counteract that does not return for a considerable number of weeks.

Wiring of the ends of the bones should not be countenanced, nor should the sewing together of the ends of the bones with catgut be practiced, because it leaves foreign material there. Chromicized gut or other suture material may act as a nidus for the multiplication of germs.

Dealing with the patella is important. I prefer to shave off all the articular surface, leaving a certain amount of its external portion intact with the quadriceps extensor muscle. I am sure it is much stronger than when we remove the patella completely.

The after-treatment is of importance. Where we get primary union, or union by secondary intention, as the case may be, the patient should be under the guidance and direction of the surgeon for the next six months or so. I have seen several knee-joints run riot, so to speak, because no attention was paid to them afterward. In one case, even three months after excision of a tuberculous knee-joint, the bone has not fully recovered from the disease, there being a certain amount of osteoporosis. With the weight of the body coming on one place more than another, in a little while there will surely be more or less giving-way. To counteract this difficulty, however, I have made it a rule for these patients to wear a knee-splint for at least six months after excision.

CHOLECYSTOTOMY AND CHOLECYSTECTOMY AS PRACTISED IN THE CLINIC OF MR. MOYNIHAN

By HAROLD COLLINSON, M.S., F.R.C.S.

CHOLECYSTOTOMY

The preliminary treatment of patients to be operated upon for gall-stone disease is identical with that in all abdominal operations.

Preparation of the Surgeon. The cleansing of the surgeon's hands, and those of his assistant, is performed as follows: After a preliminary "social" scrubbing with nail brush and soap beneath a stream of hot water the hands and arms are methodically cleansed with sterile swabs and a nail cleaner in a bath of hot sterile water, this scrubbing is continued for at least five minutes and then the hands are rubbed over with a solution (1 in 500) of sublamin in methylated spirit (70 per cent), and the latter allowed to dry upon the hands. A second and a third bath of sterile water are used and the same routine carried out, sublamin spirit being applied after each scrubbing. A full twenty minutes is thus spent in sterilization of the hands.

The assistant next puts on a pair of sterile rubber gloves and gives the patient's abdomen a final cleansing with ethereal soap, and finishes by swabbing the whole operation area with "sublamin spirit." His gloves are removed, the hands again cleansed with spirit, and a clean pair of gloves put on and the arms covered by sterilized sleeves which pass beneath the cuff of the gloves. Sterilized caps and mask are worn by surgeon and assistants.

Position of Patient. An inflatable rubber cushion is placed beneath the patient's back at or a little above the level of the liver, and as soon as anæsthesia is progressing the cushion is inflated by a foot pump. This manœuvre makes the liver present in the wound and enables more easy access to the ducts to be obtained. In addition a slight tilting of the table, so that the pelvis is slightly lower than the thorax, will often be found of service.

Technique of Operation. Over the site of the incision in the skin a number of light transverse scratches are first made with a needle. The scratches mark the position for the insertion of the deep silkworm-gut sutures in closure of the wound, to be described later, and ensure accurate apposition of its edges.

An incision from 4 to 5 inches in length is made over the right rectus, near its outer margin; its upper extremity begins at the costal margin, and the incision extends vertically downwards.

The external sheath of the muscle is divided in the whole length of the incision and the muscular fibres separated with the finger, the muscular

branches of the intercostal nerves being preserved intact as a rule.

Bleeding points are seized with pressure forceps, those in the muscular tissue being immediately ligatured or underrun by a suture, in order to avoid laceration of the muscle by chance traction on the forceps. The surrounding skin and edges of the wound are now protected by a "handkerchief" of "tetra" placed upon each side, and held in position by special forceps which fix its margin to the sheath of the rectus and the extremities of the wound. These prevent contact of hands or viscera with the patient's skin and soiling of the margins of the wound by any chance leakage of bile. A good deal of bacteriological work has been done by us, on the lines suggested by Döderlein's observations, which shews that most of the infections in wounds come from the patient's skin. In no operation do we allow the skin to be seen after the incision has been made. The "tetra" cloths and our special forceps for the ends and sides of the wound are a very great help.

In most cases exploration of the ducts is facilitated by extension of the wound upwards and inwards, parallel to, and half an inch from the costal margin, the fibres of the rectus being divided in the line of the incision; for the majority of gall-bladder operations in thin patients this extension is however not necessary.

The posterior sheath of the rectus is now picked up between two pairs of forceps and incised, the peritoneum opened and a finger inserted, the opening then enlarged by scissors to within a short distance of either end of the wound, and a preliminary exploration of the parts made.

The next step is the isolation of the operation area by means of large flat gauze swabs accurately placed. The exact placing of these swabs is important.

The first is packed down to the upper part of the right kidney pouch, it is large and should lie between the duodenum and common duct on the inner side and the abdominal wall on the outer, a second slightly smaller swab is passed towards the middle line, lying over and protecting the stomach to the inner side of the gall-bladder and common duct. A third large swab is placed below, packing the small intestines and colon out of the way, and protecting them; occasionally more than one swab is necessary in this situation. All the swabs have a tape which passes out of the wound and is kept stationary by a clip attached to its extremity; before insertion each is wrung out in hot sterile salt solution.

The operation area is thus entirely isolated from the rest of the abdomen, and the further steps of the operation can be proceeded with.

The gall-bladder and ducts are next carefully freed from any adhesions, these may be thin and delicate or firm and tough, in the former case gentle stripping with the finger wrapped round with gauze will suffice, in the latter case they must be ligatured and divided. The greatest possible delicacy and care is exercised in order to avoid risk of laceration of adherent viscera. When all the ducts are laid bare, the gall-bladder and the liver round it is seized by the left hand and gently dragged downwards, this exposes the ducts more fully and allows of thorough palpation of them, the presence of calculi in the gall-bladder or the ducts is made clear and an accurate idea of the extent of the operation required is formed.

If calculi are present in the gall-bladder the technique of their removal is as follows: A large square, consisting of four layers of gauze, between which a sheet of rubber tissue has been sewn, is taken, and through a small hole in its centre a pair of catch forceps is passed, these seize the fundus and pull it through until a cone of gall-bladder presents. The swab is then arranged so as to cover and protect the rest of the operation area. If the gall-bladder be tightly distended with bile, a larger aperture must be made in the swab and considerable care exercised in traction with the forceps. An aspirating needle (Ochsner's or Douglas Powell's pattern), with a rubber tube passing over the side of the table, is pushed into the gall-bladder which is held by forceps, applied about $\frac{3}{4}$ of an inch apart. After withdrawal, the needle is placed on one side and not touched again, and the puncture is enlarged with scissors and any escaping bile rapidly mopped up by the assistant with moist gauze swabs, held in long handled forceps. Each mop is thrown away immediately it has been used, and great care taken to avoid soiling of the fingers with bile which should always be regarded as a septic fluid. The grip of the forceps is next changed so that the edges of the incision are seized, and by their means the wound may be held open, or closed when they are crossed.

Through the opening a gall-stone scoop is passed, and the calculi removed; if there are many stones, several introductions of the scoop are needed until the gall-bladder is completely cleared. When all the stones which can be felt with the scoop have been removed, the clips are crossed so as to close the opening, and whilst the left hand steadies the fundus by this means the right is passed beneath the protecting rubber and gauze sheet, and the neck of the gall-bladder and cystic duct carefully palpated; if other calculi can be felt in this situation, an attempt is made to dislodge them by gently milking them

back into the gall-bladder between the index and middle fingers.

If this is possible they are removed with the scoop, and in other cases dislodgement is effected by the scoop working in concert with the fingers externally.

The common duct is finally explored, and if no calculi are found to be present, drainage of the gall-bladder is provided for in the following manner: a rubber tube of one third of an inch in diameter and with thick walls is inserted into the incision so that 2 to 3 inches are laid within the gall-bladder, it is now fixed by a single catgut stitch, which passes through all the coats of the gall-bladder with the exception of the mucosa, close to the margin of the incision, and through the tube, this is tied and fixes the tube firmly. This suture is left long. The remainder of the incision and this stitch are now buried by a continuous catgut suture from side to side, taking all the coats with the exception of the mucosa. This suture embraces the tube closely and invaginates the exposed mucous membrane, so that no leakage can occur. After the fundus has been cleansed with moist gauze mops the rubber and gauze sheet is removed by slipping it over the drainage tube, all instruments which have been exposed to the risks of soiling are laid on one side, and the hands are carefully rinsed, or if soiling has occurred, a fresh pair of gloves is put on.

The swabs within the abdomen are now removed and the right margin of the omentum arranged so as to cover the intestines and surround as much as possible the gall-bladder and tube.

The abdomen is closed in the following manner. After deflation of the rubber cushion beneath the patient a continuous catgut suture is commenced at the lower angle of the wound, including the peritoneum and the posterior sheath of the rectus, this is continued slightly beyond the middle of the wound. The suture is then temporarily laid aside and a similar procedure adopted for the upper portion of the wound, commencing above and terminating below at the gall-bladder.

Silkworm-gut sutures, about 1 inch apart, inserted along the scratches previously made, are next passed through skin, anterior sheath and muscular tissue of the rectus on either side, and left untied for the present. When all these have been placed the catgut sutures, which were temporarily laid aside, are now continued through the anterior sheath of the rectus to their starting place below and above and tied off. The sheath of the muscle is overlapped by the suture which is an interlocking one.

The skin edges are next brought into apposition by Michel's metal sutures, and finally the silkworm-gut stitches are tied loosely and without tension.

The wound is dressed with a simple pad of sterile gauze, kept in position by a solution of formalin mm20 in 1 oz. of sterile gelatine. Outside this a light covering of wool and a many-tailed bandage is applied; the drainage tube brought through and its extremity placed in a U-shaped glass tube, which is suspended to the side of the bandage by safety pins. In this manner the dressings are kept entirely dry, movements of the patient do not displace the tube from the vessel for the reception of the bile, and an accurate measurement of the amount of drainage is obtained.

The metal sutures are removed at the end of 48 hours, and the silkworm-gut stitches in ten days or a fortnight. The tube usually comes away in about a week.

In cases where after examination of the gall-bladder and ducts, and cholecystectomy is decided upon, the operation is performed as follows:

CHOLECYSTECTOMY

The liver being rotated, the cystic duct and its junction with the common duct are defined, at a short distance from its termination a circular incision is made around the cystic duct and a peritoneal cuff reflected towards the common duct. Two pairs of long forceps with a curved beak are now applied to the cystic duct, which is divided between them, the stump is ligatured with catgut and the forceps upon this end removed. By gentle gauze stripping, the cystic artery is next defined, divided between forceps, the proximal end ligatured and the clip removed.

If it be decided not to drain the ducts, the stump of the cystic duct is buried by suturing the reflected cuff over it by two or three sutures of Pagenstecher's thread; before this is done the gall-bladder is separated from its fossa for a short distance by insinuating the finger gently between its pelvis and the under surface of the liver. This separation is at first only carried sufficiently far to allow of access to the stump of the duct, for the suturing is much facilitated by the traction which can be made upon the liver by the partially separated gall-bladder. The stump is touched with the cautery and then buried in the manner described.

The further separation of the gall-bladder can now be proceeded with; by careful dissection with the gauze-covered finger, the gall-bladder is raised from its bed with comparative ease, and is left attached only by the peritoneal fold around it, this is divided with scissors about half an inch from the liver and the gall-bladder is free. A raw surface surrounded by a peritoneal collar is now left, some

slight bleeding may occur from this or from the cut edges of the peritoneum, but sponge pressure is usually sufficient to arrest it; if this is not so, bleeding points on the raw surface may be underrun by a fine catgut suture, or, if upon the peritoneal edge, included in a ligature.

The peritoneum around the raw surface is now closed over by a continuous catgut suture commencing at the cystic duct and terminating at the margin of the liver. The operation area is finally cleansed and the abdomen closed.

If drainage of the ducts be necessary, the stump of the cystic duct is not ligatured, but its edges are seized with small French vulsella and an incision made into it at its junction with the hepatic ducts of sufficient size to admit a rubber drainage tube, this is fixed by a catgut suture which passes through it and picks up the wall of the duct with the exception of the mucosa at a little distance from the cut edge, the rest of the opening is closed snugly around the tube by catgut sutures passing from side to side of the incision and taking the peritoneal and muscular coats only.

In certain other cases it may not be thought necessary actually to drain the ducts, but some doubt may be felt as to the security with which the stump of the cystic duct has been covered in, or it may have been impossible to sequestrate it by a peritoneal cuff. In such a case, after ligature with catgut and removal of the gall-bladder, a rubber drainage tube is passed down to the stump of the duct and retained in position by a catgut suture passed through it and catching up the tissues by the side of the ligated extremity. When the catgut ligature around the duct softens, as it will do in four or five days, bile may flow through the tube for a short time, in other cases no discharge of bile occurs, and on separation of the suture holding the tube (about a week) the wound rapidly closes.

ANOTHER METHOD FOR FORMING A GASTRIC FISTULA

By ROBERT T. MORRIS, M.D., New York

It is not customary to report unsuccessful operations, but the one here described looked so well and so long a time may pass without opportunity for repeating it myself, that it may be well to publish a note of the case. Charles M., 71 years of age, drank hydrochloric acid by accident. The esophagus became nearly or completely occluded during the following three weeks. Rectal alimentation. Thirty pounds loss of weight. Patient extremely feeble when I first saw him on November 25, 1907. Operation at St. Mark's Hospital on the following day. Incision parallel with the left costal border, in the expectation of performing Witzel's operation. Stomach so much contracted that this operation was impossible of performance. A ribbon of skin about an inch wide dissected away from either side of the original incision. Ribbons about four inches long remained attached at their cephalad ends. Free ends of ribbons drawn into an opening in the stomach near attachment of gastro-colic omentum and sutured to mucosa in such a way as to leave a round tube of skin. Margins of ribbons sutured in such a way as to complete the tube. Gastro-colic omentum easily wrapped about the tube and sutured to the abdominal wall, to guard against leakage and to help furnish lymph circulation for the tube of skin. Rubber tube left within the skin tube,— with one end in the stomach and the other end free outside. Wound closed. Operation performed rapidly, and looked to be very satisfactory from a mechanical point of view. Patient too feeble to rally. Died on the following day. When occasion presents for repeating the operation, I shall dissect up a strip of skin four or five inches long and two inches broad, for making the skin tube, instead of having it consist of two ribbons of skin. So far as I can judge, this skin tube can be carried to the stomach easily, no matter how much it may be contracted and retracted, and the operation appears to be more simple than the classical ones. The skin tube lies obliquely to the plane of the abdominal wall and would apparently remain closed against leakage of stomach contents, and at the same time would allow of passage of the feeding tube.

EDITORIALS

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EDITION FOR THE BRITISH EMPIRE

With this the first issue of the sixth volume of Surgery, Gynecology and Obstetrics, the editorial management takes pleasure in announcing the beginning of the publication of an Edition for the British Empire. The American and British editions will contain the same scientific material and will differ only in the external makeup and in the relative positions of their editorial staffs.

The unusual interest manifested by the English practitioners since this publication made its appearance in America, as shown by their contributions and their subscriptions, determined the Editors to open negotiations with the men in Great Britain, with the idea of bringing the publication nearer to them by establishing a London office, and of further unifying the surgery of the two great English-speaking nations, by appointing a few of their representative surgeons to organize an editorial staff corresponding to the editorial staff of the original American edition, said staff to co-operate directly with the editorial management in obtaining for the publication a greater proportion of the representative surgical contributions of Great Britain.

In this undertaking we have been met with great cordiality, and the eminence of the men who have consented to serve upon our editorial staff argues well for the success of our edition for the British Empire.

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In establishing a closer friendly relation with the surgical practitioners of the British Empire, we are only following our original conception for the attainment of the greatest efficiency in the editorial conduct of a surgical magazine, viz.: that the editorial direction should be under the guidance of men actually engaged in the practice of surgery, gynecology or obstetrics, as they, only, are in close touch with the new, and can judiciously discriminate between the practical and the visionary. We shall depend upon this collaborating staff to keep us in communication with conscientious experimental or technical surgical accomplishments in all divisions of the United Kingdom.

It is the ambition of the management to duplicate the success of their American edition by a like success in Great Britain and the Colonies. We believe this is not impossible; and the accomplishing of such a feat will go far toward attaining the ideals of the organ-

izers; viz., to make SURGERY, GYNECOLOGY AND OBSTETRICS one of the strongest international surgical magazines published. To this end, we promise that no proper efforts nor expense will be spared in developing the edition of the British Empire to the highest degree of excellence. FRANKLIN H. MARTIN.

CHOLECYSTOSTOMY FOR MYOCARDITIS

Of the three groups of heart disease, valvular disease, disease of the coronary arteries, and myocarditis, the last named is of growing surgical importance. Disease of the coronary arteries and defects in the valves of the heart concern the surgeon when he undertakes operations which require prolonged anesthesia or entail great shock.

The secondary diseases, of which nephritis and myocarditis may be mentioned as illustrations, are generally due to some form of toxæmia. These conditions, through our ignorance of their source, are often called cryptogenetic toxæmias. Indubitable evidences of toxæmia are found in the blood, in the excretions, and in co-incident symptoms. A part of the toxæmias are considered to be of endogenous origin, and their source is traced to primary changes in one or more of the ductless glands; in Graves' Disease, for example, to the thyroid and throidectomy leads to the most perfect cure, and in the severe toxæmias of infancy to perverse assimilation, and complete recovery follows starvation or change of diet.

In spite of the great preponderance of endogenetic toxæmias, there are still some examples of the exogenetic disease, which appeal to us most strongly as curable. Thus, the anæmia of the miners disappear when the anchylostoma duodenalis is driven off with thymol, and diphtheria vanishes with the use of antitoxine. Chronic infections of the mucous cavities of the body are prolific sources of toxæmia, and chief among them stands the infection of the gall-bladder in the production of a toxæmia which manifests itself in the symptoms of myocarditis. Not every case of chronic cholicystitis is attended by myocarditis, any more than every case of myocarditis is due to this infection, but it is one of the most interesting manifestations of the disease, and in a considerable number of cases of cholicystitis it has proved to be, by all odds, its most conspicuous and troublesome result. Why this is the case, more careful studies than our clinical observations alone may yet make clear. This phenomena is analogous to the selection of injested poisons. The toxæmia of lead poisoning shows itself in wrist drop, while that due to methel alcohol strikes the optic nerve, and other poisons show great and inexplicable diversity in the production of symptoms and lesions.

* * *

It is common experience that many patients who suffer of tachycardia, dilated heart, myocarditis, give a history of long past "bilious attacks," or symptoms of present cholicystitis. This condition presents itself in the middle-aged and the old; in the robust and the flabby; in the alert and in the sedentary; in the overfed and in the abstemious; in men and in women.

Such patients present the history of gradually increasing dyspnœa; sometimes, after unusual strain, or angina-like attacks, and at last such severe symptoms as to require the serious attention of the physician. The pulse is now found rapid, 90-120; the temperature varying between 97-101, and the respiration slightly accelerated. There is, moreover, an open mouth, a sighing inspiration, and often an occasional cough. The complexion and conjunctivæ are dusky, if not yellowish, and the skin cold, moist, and soft. The patient has usually lost noticeably in weight, 20-60 pounds. The blood pressure is not high, perhaps 140-

150, corresponding, generally, with the age of the patient; the hemaglobin index, 70-90; and the leucocytes 10,000-18,000. If the examination is continued over a considerable period the urine will show an occasional shower of casts and a little albumen. The abnormal excretory elements, indican, aceton and purin bodies will occasionally show themselves. The area of cardiac dullness will be increased from two to five inches and the apex beat correspondingly displaced. Often there is valvular incompetency which increases with the dilatation. The liver is generally, though not always, enlarged in a downwardly direction. The spleen is not recognizably increased in size. The gall-bladder is tender, especially after the angina-like attacks and sometimes forms a prominent tumor in the abdomen. Otherwise the patient presents no evidence of disease. The history varies somewhat in the onset of the angina-like attacks, in the rapidity or severity of the symptoms and in the appearance in other parts of the body of co-incident symptoms of toxæmia. The functions of the stomach are most often disturbed. There is nausea or regurgitation or vomiting of food. The vomiting is sometimes so frequent and severe as to be a factor in the production of heart strain and marasmus.

* * *

Through the suggestion and support of a colleague, the writer has been able to demonstrate clinically the verity of this theory, and restore to health a number of cases giving symptoms of myocarditis. The patients have submitted to his critical examination, and been put under favorable surroundings and careful medical treatment for weeks or even months, without showing substantial improvement. On his recommendation the gall-bladder has then been opened, usually under Schliech's local anesthesia, or, in a few cases, with ether narcosis, and the diseased gall-bladder drained. The results have been most marvelously gratifying to the patients and almost incredible to the observer. Immediate improvement has followed in every case. The pulse rate has fallen rapidly, the heart and liver have returned to almost their normal size and function, and the comfort, appetite, and nutrition of the patient have rapidly increased. In one case, which had been diagnosed carcinoma of the liver on account of the irregular tumor in the region of the gall-bladder and the great size of the liver, the recovery was almost miraculous; but the fistula closed soon after the patient went to his business, and his symptoms returned. They disappeared, however, when drainage was re-established. One patient, a man of forty-six, who had been invalidized for nearly a year, has been able to resume his occupation as locomotive engineer and continue it up to the present time, a period of four months, without relapse.

In every case the condition of the gall-bladder has evidenced in one way or another the location and chronicity of disease, sometimes by the enormous thickness of its walls, sometimes by the presence of black bile or stones, and sometimes by two or more of these conditions. That the cholicystitis was the real and only source of the myocarditis seems clinically demonstrated by the indubitable and uniform improvement of the condition of the heart after the cholycystostomy. The average duration of the drainage has been eight weeks, though in some of the cases it has lasted three months. Fortunately, an autopsy has been obtained on one of the patients who had severe angina-like attacks, and upon whom the sentence of sclerosis of the coronary arteries had been repeatedly pronounced. He was sixty-two years old, and yet made such substantial improvement after the cholycystostomy that he was able to attend to his business with only slight restrictions to his habitual activities. He died after

a general anesthetic, for an operation connected with an accident to his inguinal hernia. The coronary arteries were found at the autopsy to be soft and young, and capable of nourishing the heart muscles.

All of these patients have given indisputable symptoms of toxæmia in the morphological elements of the blood and in the abnormal chemical constituents of the urine, as well as in the general complexus of symptoms. The examination of the contents of the gall-bladder has not disclosed the character or source of the alleged toxines, and no infectious organism has been isolated which can be put forth as the cause of the primary disease of the gall-bladder, the resulting toxæmia, and the secondary myocarditis from the symptoms of which the patients sought relief.

Bayard Holmes, M. D.

THE SURGICAL TREATMENT AND PREVENTION OF PANCREATIC DIABETES.

The studies of the past few years direct attention more and more to the pancreas as the organ most concerned in the production of diabetes. Greater care in the investigation of the morbid histology of the pancreas in diabetes reveals a constantly increasing proportion of cases in which some organic defect exists. We are not yet prepared, however, to grant that all cases of diabetes are of pancreatic origin, or that all the microscopical variations from the normal which have been found in the pancreas possess etiological significance. There certainly is more than one type of diabetes. Pathologically as well as clinically, the variations are too pronounced to permit of a common grouping. There is abundant evidence to prove that carbohydrate metabolism is an exceedingly complex process, depending on the normal integrity and co-operation of more than one organ. The occurrence of diabetes without demonstrable lesions of the pancreas is consequently not surprising, and does not disprove the pancreatic nature of other instances in which that organ is found diseased. The changes may undoubtedly be coincident or accidental, but independent of the diabetes, and it has long been recognized that the cellular alterations in the pancreas in certain types of the disease are not so distinctive as to be significant in view of the widespread sclerosis of the tissues and organs generally. Diabetes may be the cause instead of the result of changes in the pancreas. On the other hand, diseases of the pancreas are not infrequent without glycosuria. Enough healthy gland tissue may remain in such instances to preserve carbohydrate equilibrium. Less easy to reconcile with the pancreatic theory of diabetes are the observed cases in which complete disintegration of the gland has occurred from cancer, hæmorrhage, suppuration, and necrosis, without the appearance of sugar in the urine. Emphasis must, however, not be placed too strongly on the negative evidence except to point the fact that it is not yet proved that diabetes is always a pancreatic disease. The fact remains after all is said per contra that lesions of this organ constitute the one definite pathological basis in diabetes which research has furnished us. The gland changes noted include acute pancreatitis, calculi, cysts, malignant neoplasms, fatty degeneration, and most frequently chronic pancreatitis. Acute pancreatitis is not a common disease, and is rarely productive of glycosuria, owing to its extreme fatality and fulminant course. We are inclined to agree with Robson and Cammidge (The Pancreas: Its Surgery and Pathology. W. B. Saunders Co., 1907), that the occurrence of glycosuria during the course of carcinoma of the pancreas, cysts, or calculi is probably not a direct effect of these morbid factors, but

rather a result of chronic inflammatory changes of the parenchyma which arise secondarily.

Chronic pancreatitis remains the most frequent lesion associated with the production of glycosuria. The relation which the pancreas bears to the intestines and other hollow abdominal viscera exposes it to invasion by bacteria through its ducts, while infection may be brought to it by the blood current. Low grade infective process may originate in such manner and by gradual destruction of the gland structure eventually so greatly interfere with its glycolytic function as to produce glycosuria as a secondary effect. Both experimental and clinical evidence have shown that glycosuria occurs only when the greater part — equal to three-fourths of the gland experimentally — has been removed or destroyed by disease. The appearance of sugar in the urine, therefore, points to an advanced generalized lesion. Our clinical knowledge of chronic pancreatitis has been for the most part learned during gall-bladder explorations for stone. The association of chronic pancreatitis with gall-stones is a frequent one.

Quenu and Duval (*Revue de Chirurgie*, October, 1905) report 118 cases associated with gall-stones. The association of certain types of glycosuria with infections of the gall-ducts and gall-stones has been known for some years. The explanation of the connection between these two conditions must assuredly be sought in the condition of the pancreas. Robson and Cammidge report 65 consecutive cases where calculi were found in the common duct at operation, and the pancreas was enlarged, sugar being present in the urine of 4 cases. In 3 the glycosuria was minimal (0.2 per cent.), and disappeared after operation. The fourth case (sugar 0.4 per cent.) subsequently developed true diabetes. Of the last 30 cases of glycosuria seen by the writer, 3 presented unequivocal signs of gall-stone disease. Difficulties arise in attempting to interpret the association. They may be of coincident occurrence, the outcome of an infection common to both gall-tract and pancreas, or the pancreatitis may arise secondarily to the gall-bladder disease by extension via the pancreatic duct. It is but natural, especially in view of the present tendency to substitute surgical for medical therapy when the latter is merely palliative and less than satisfactory, that the suggestion should be made that cases of glycosuria, due to chronic pancreatic infections associated with cholelithiasis, might be successfully treated by drainage of the gall-bladder. Admitting that under certain favoring conditions the venture might prove a tempting one, and be carried through with success, so far as the cholelithiasis is concerned, it is difficult to see what good toward the diabetes could be accomplished, except perhaps by removing one source of irritation and toxæmia to improve the patient's general condition, and, secondarily, exert some restraining influence over the progress of the diabetes. The advent of diabetes in cases of chronic pancreatitis indicates widespread and advanced disease of that organ. The cure of an established glycosuria by gall-bladder drainage would indicate that at least a partial anatomical restitution of the diseased gland tissue had been brought about by the operation, a result which, to say the least, cannot be reasonably expected.

Robson and Cammidge have undoubtedly secured in three cases a disappearance of glycosuria following the removal of common duct-stones. It is to be remembered, however, that these were not cases of true diabetes, but of an extremely mild grade of glycosuria, probably dependent on a pancreatic process, which was not sufficiently advanced or chronic to prevent restitution above the requisite functional limit. Their fourth case of more severe and inveterate type was uninfluenced by the opera-

tion. It is the experience of the writer and the views of Robson and Cammidge are concurrent (ibid., page 278), that glycosuria associated with gall-stone disease is, as a rule, of extreme chronicity and mildness, resembling in progress the cirrhoses generally. Diet and hygiene suffice in such cases to maintain a good compromise toward the diabetes.

The great advantage which accrues from a clearer insight into the pathology of disease is that it enables us to progress in the direction of preventive therapy. Knowing the cause and something of the mechanism of production of a disease opens at once a way to proceed against its origin. The dependence of many cases of glycosuria on chronic pancreatitis is no longer doubted. That glycosuria of this character is a comparatively late development in a very chronic inflammatory process may be assumed from our knowledge of experimental pancreatic diabetes. We know from recent operation records that chronic pancreatitis is most frequently associated with cholelithiasis. The rational treatment of chronic pancreatitis has been rendered possible by the information obtained from surgery of late years. For our present knowledge of the subject we are in great part indebted to the work of Mayo Robson. This authority and his co-worker, P. J. Cammidge, in the present number of this journal, enter a strong plea for the early operative treatment of cases of chronic pancreatitis in order to anticipate and prevent the further progress of the interstitial change, with perhaps an eventual diabetes. They disclaim the possibility of curing by such means a glycosuria when once established, and urge the claims of early drainage as a preventive measure only. The frequency of glycosuria in chronic pancreatitis is relatively not great and it is of course impossible to forecast its appearance in any given case, still the danger of such a complication undoubtedly exists in every case, and serves to add a further indication for early operative treatment. Unfortunately, the symptomatology affords us no absolute criterion as to the pancreatic or non-pancreatic nature of any case, and attempts at clinical distinction are difficult, if not impossible, except in cases with a past history of pancreatic disease or cholelithiasis. Robson and Cammidge depend upon the so-called "pancreatic reaction" in the urine for the recognition of pancreatitis. This test, first described by Cammidge in 1904, has been further elaborated and improved, and is again advanced by its originator as a reliable diagnostic method, after an experience covering 800 applications. Its employment in other hands has apparently been less than satisfactory, if we are to judge from the comparative silence regarding it in the literature of the past two years. This is hardly surprising in view of the technical difficulties of the method and the necessity for skill and experience in interpreting the results. The emphatic reassertion of his claims for the test, by Dr. Cammidge, and the testimony of Robson as to its clinical value will reawaken interest in the method, and result, it is hoped, in establishing the claims of its discoverer and his associate. The work of these authors in the elucidation of diseases of the pancreas is to be commended as a distinct advance in clinical pathology. Their conservatism is noteworthy and the emphasis of their teaching is chiefly placed upon the factor of prevention. If the diagnostic criteria they lay down can be established by experience, it may become possible to recognize this class of cases in their incipiency, and to successfully deal with them by drainage before the pancreas has become so encroached upon by disease as to be reduced in functional capacity below the minimum necessary for metabolism.

ARTHUR R. ELLIOTT.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

A clinical meeting was held at the MichaelReese Hospital, November 1, 1907, with the President, Dr. A. J. Ochsner, in the chair.

1. CRUSHING INJURY OF THE FOOT

Dr. Louis A. Greensfelder: The first case that I wish to show you is that of a boy, twelve years of age, who was admitted to the hospital on July 31st, at 10:40 A. M. In crossing Madison Street, between Franklin and Fifth Avenue, he was struck by a west-bound Madison Street car and knocked unconscious. He was taken to the Cook County Hospital shortly after the accident and remained there for two days.

On admission to the hospital the patient was in a state of collapse; quite delirious; temperature 102.6°. The fifth tarsal and metatarsal bones of the left foot were totally destroyed; the astragalus was badly crushed and disarticulated; the soft parts were crushed to a pulp; the limb was swollen and red to above the knee. In the right foot the first, second and third metatarsals were crushed; the muscles and tendons were badly bruised; the foot was greatly swollen and red to about two inches above the ankle.

When this patient was admitted to the Michael Reese Hospital, the wound was simply opened, irrigated and swabbed with a 95 per cent solution of carbolic acid, and this followed by the application of alcohol. The wound was dressed from five to six times a day; a line of demarkation was allowed to form and to amputate itself. Nothing has been done excepting to cleanse the wound three or four times a day at first, and now it is dressed about once a day.

I simply present this as a case showing the results of conservative surgery. We have saved a large portion of the foot as well as the entire ankle, and we think with a little plastic work we will have quite a serviceable stump for this patient. The only interesting feature about it is to show what conservative surgery may do for such a patient.

2. ARTHRITIS DEFORMANS

The second case I wish to show is one that was brought to me by a colleague this evening as one of arthritis deformans. The history, briefly, is this: The present trouble began last January. The first thing the patient noticed was that the great toe of the right foot became swollen, red and painful. The joints were immovable without edema; the joints of the toe were involved, and the trouble rapidly spread so that both ankles became involved, one at a time, and then changed from one ankle to the other; it went up to the knees, and these were similarly involved, and then the hips were affected. The condition then traveled up the shoulders, extended to the elbows and fingers. The condition in the joints seems to change from day to day. At present the patient holds the neck rather rigid, and motion of the lower jaw is impaired. According to the previous history, patient had articular rheumatism when six years of age, from which he recovered without any ill effects. The history is negative as to other diseases, except he had measles when a child. He has never had tonsillitis.

On physical examination this patient presents nothing but a mitral stenosis. He has a scoliosis; he has an ankylosis of the atlas in the axis. He has a partial ankylosis of the jaw. The X-ray shows a large exostosis opposite the (?) cervical vertebræ, in all probability, an arthritis deformans. There are no nodes to be felt anywhere. He has no enlargements of the spleen, liver or glands.

The case simulates to some extent cervical Potts' disease. We were unable to make an examination of the pharynx, because the patient cannot open his mouth sufficiently far to do this.

I present this case from the standpoint of differentiating between cervical Potts' and an arthritis deformans. He has no glandular enlargement anywhere; the liver is not enlarged, nor is the spleen. There is no evidence or history of tuberculosis or syphilis.

3. SARCOMA OF THE NECK

This patient is 28 years of age and was first seen by us two years ago, at which time she had a small swelling in the nape of the neck. It felt like, and was thought to be, a lipoma. The opinion given was that it was a lipoma, harmless, and could be removed any time it gave trouble. It gave the patient no inconvenience until three or four months ago, when it began to enlarge suddenly and took on a different shape and contour, and we advised

then that it be removed. This was done under local anesthesia, we believing that it was not deeply situated, but on cutting down upon the growth we found that is was situated just on the spinous processes of the fourth and fifth cervical vertebræ, and it was with great difficulty enucleated. After enucleation it proved to be a rare form of sarcoma. Dr. Herzog will demonstrate the specimen as well as make the pathological report. It started as a lympho-adeno-cysticum, and later developed as a sarcoma.

Dr. Maximilian Herzog: This very large tumor which is here shown is one of the most interesting neoplasms that we have to deal with. It is particularly interesting from a histogenetic standpoint. These tumors were described first a number of years ago by Birch-Hirschfeld, and the name given to them is embryonal renal adeno-sarcoma. A number of cases have been reported in Europe, and about six years ago I reported the first case in America. The patient was operated upon by Dr. D. Lewis.

Our present case is an enormous tumor. In certain parts of this and other tumors of the same type the tissues are absolutely epithelial, and if these neoplasms had no other structures than these, they would have to be classified as a carcinoma, or as a malignant epithelial neoplasm. But in other parts they show sarcomatous tissue, embryonal connective tissue, and not merely ordinary fibrous connective tissue, but we are liable to find striated muscle fibers, and in some places we find even bone and cartilage in them. So they are tumors very much mixed in type.

It has been difficult to trace the origin of these tumors. Wilms made the first attempt to do this. Let me say a word or two with reference to their histogenesis. You know that the permanent kidney is really the third urinary organ we have. There is the pronephros first, which is a very transitory structure in mammalian animals; then the Wolffian body, an important structure, and then develops the permanent kidney, as you know. The nephrotome, from which the temporary and the permanent kidneys develop is cut off from the myotomes early in embryonic life. Wilms believes it is simply the mesenchyma of the myotome which gives rise to these embryonal adeno-sarcomata; but I believe that it is not merely the latter, but a complete portion of the myotome which becomes included in the nephrotome, because in these tumors we find all the structures which normally develop from the myotome, viz.: muscle, cartilage, bone.

These tumors then grow in the kidney, not from the kidney tissue proper, but from embryonal inclusion of the early myotome. They in fact often displace kidney tissue, so that it may be atrophic, in consequence of pressure atrophy. These neoplasms generally do not give rise to hemorrhages as do other tumors of the kidney, for instance, the very vascular hypernephromata or adrenal tumors.

In this case the post-mortem was made by Dr. Kaltnisky, interne and assistant in the laboratory, who removed all the internal organs en masse. When, later on, I dissected the mass which was conglomerated together by numerous adhesions, I at first thought I was dealing with a lympho-sarcoma of the mesentery, as the tumor had grown partly into the mesentery and it appeared that the mesentery formed its pedicle, but as soon as sections of the tumor were made I recognized that this was a mistake, because the tumor presented that peculiar structure which is only found in these embryonal adeno-sarcomata of the kidney. The specimen shows a congenital anomaly, a horseshoe kidney. That is one anomaly which makes it probable that there were present some other anomalies, namely, embryonal inclusions. However, I do not know exactly from what part the tumor sprang, because I have not yet dissected the kidneys, because we want to have the tumor photographed.

You will see under the microscopes a section from the former case previously reported, a section from to-night's new case, also a section from a renal tumor of the same kind in a pig. I have during the last year had a chance to see a number of such tumors in pigs which show that the embryonal renal adeno-sarcomata also occur in the lower animals.

4. Embryonal Renal Adeno-Sarcoma

The next case is that of a child which interested me from a differential diagnostic standpoint. I wish to present a specimen in connection with this case. The child was kicked in the abdomen while playing with another child on July 4th. There was very little complaint made at the time, but at night the child cried with severe pain in the abdomen. This pain became more severe until on Saturday morning a physician was consulted, who prescribed compresses, etc., with no relief. The child was admitted to this hospital on July 7th. On examination we found a small tumor, apparently the size of a hen's egg just above the pubes, which led us to believe that we were dealing with a hematoma. We simply allowed the patient to remain in bed, treated her, and watched her carefully, believing at the time we had a simple hematoma, and not an intraperitoneal growth. The mass began to grow. About July 20th, six or seven weeks after her admission to the hospital,

this tumor showed no disposition to disappear; on the contrary, it became larger and somewhat softer, and we thought yet it was a hematoma that was breaking up. We advised opening the abdomen, which was done, and when the peritoneal cavity was opened there was an enormous gush of blood. I enucleated a small piece of the tumor mass, which was examined microscopically, but the hemorrhage was so severe that nothing further could be done. We therefore packed with iodoform gauze and put the child back to bed. This tumor continued to grow until it occupied the entire peritoneal cavity, and the child died on October 18th.

The post-mortem and pathological findings of these last two cases will be described by Prof. Herzog.

1. CARCINOMA OF THE SUPERIOR MAXILLA

DR. L. L. MCARTHUR: I have first to present to you a case not of interest because of its rarity, but as illustrating the fact that some of the apparently hopeless cases may still gain some relief by surgical interference.

I had sent to me a year ago the worst case of carcinoma of the superior maxilla with which I have had to deal or have attempted to operate upon. The tumor was so large as to prevent the closure of the mouth. There was difficulty in swallowing because of the extension of the tumor backwards, and there was also bulging and displacement of the eye. The usual incisions were made which are employed for trouble of this nature, and after reflecting a flap of skin in the usual way (the incision can be seen along the eye, down around the nose, and through the upper lip), the entire superior maxilla, a fair portion of the left palate, and as far back as the tonsil, were removed.

I show the case not because these operations can be performed, but because we have seen here again, after the lapse of some months, a small recurrence within the mouth about opposite the pterygoid plates. This was treated energetically with the X-ray, with a complete clearing up of that recurrence and the patient's restoration to very good health. We feared, because of the extent we had to go to the side, paralysis of the palpebral muscles, but succeeded in getting along without that. The patient has now come back to the city in the last few days, for the purpose of having an obturator made and a set of teeth to supply that portion of the jaw which has been removed. There is no sign of recurrence.

The X-ray, when recurrences have taken place after one of these major operations, offers us some hope.

2. EXTENSIVE CARCINOMA OF THE BREAST

The second case that interests me, and I thought it might be of interest to the Fellows of this Society, is one of extensive carcinoma of the breast which was operated on five years ago. Following the practice which has been in vogue in this city, the prophylactic use of the X-ray was recommended in her case. After a number of weeks' treatment the patient failed to obey instructions and as a result had a small recurrence take place in the line of the cicatrix. Returning to the Röntgenologist, he sent the patient back to me, believing the growth more extensive than ought to be left to the ray. On examination I found a recurrence involving two ribs in the precordial region, immovable, and apparently deep in the intercostal muscles. I therefore resected the chest wall. In so doing had to expose the pericardium and the lung. I present the case to show that extensive resection of the chest wall can be made in a patient who is in ordinary good health. The lung and heart were exposed. We could take the lung in the hand. After having done all the work necessary on the chest wall we closed the wound firmly, then with an aspirator needle introduced through another point in the chest wall withdrew the air which entered the chest wall during the time of operation. Union took place in the chest wall. The hemorrhage was checked before closing the wound, to avoid hematothorax. We succeeded in obtaining primary union. This operation was done a year ago last August. Since the chest wall has been removed, you can, skin only intervening, feel the heart.

This case shows it possible to open the chest wall. After the surgical work has been done you can close the chest cavity, aspirate the air which gained access temporarily, and after such access can have the normal pleural condition restored.

3. MALIGNANT EDEMA

I had the promise of three patients to appear here to-night, each of whom had been infected with the organism of malignant edema, and each of whom has been cured. I am sure their lives were saved by a line of treatment which in desperation I tried upon this patient some thirteen years ago.

This patient, about thirteen years ago, received an injury in an elevator accident, as I recall it, and fractured his femur at the lower fifth. It was one of those fractures that produces a posterior displacement, and pressing upon the nerves and vessels was endangering the circulation in the lower part of the extremity. I therefore advised wiring, which was done. After one day's preparation to

carefully antisepticize the parts, the bones were wired in position. There was no difficulty attending the operation. This was done about four o'clock in the afternoon. It was done during the period of reconstruction in the hospital, when the tiling in the operating-room was torn up, and there had been during that day considerable dust in the atmosphere. The same day, within six hours, I was called because the patient had a high temperature, a great deal of pain, accompanied by a chill. This coming so soon after the operation alarmed me. I found the wound reddened, irritated, emphysematous, and recognized that probably we had a case of acute malignant edema to deal with. There being a medico-legal factor in the case, the young man being an employe of the President of the Board of Trustees of this hospital, I desired to be unusually careful, so secured Dr. Fenger at midnight. He examined the patient, and the moment he felt the thigh, he said, "Malignant edema!" I asked him, "Shall we amputate?" He replied, "No; in the morning it will be in groin, and by noon it will be at umbilicus, and by night the patient will be dead. Good-night."

This was very discouraging to a young surgeon, and I felt I could not give the patient up without an attempt, at least, on a theoretical basis to save him. I went down to the drug room for salicylic acid and alcohol; I boiled salicylic acid in alcohol to get as concentrated a solution as possible. In cold alcohol salicylic acid is soluble to the extent of one part in two. In boiling the alcohol I used all the stock the druggist had. This hot alcoholic solution with a hot syringe was injected around the entire area that was emphysematous, thirty, forty, or fifty injections being made, injecting two or three drops each time, trying to wall off with the salicylic acid the area of infection. From that time the patient began to improve. The area that had been infected with the organism of malignant edema sloughed away; a portion of his quadriceps femoris, also the vastus internus and externus sloughed out, but eventually he made a good recovery. Of course, I had opened the wound widely to find out what the trouble was, whether it was from catgut we were using at that time, which was dipped in carbolized oil, or whether it was from the tearing up in the hospital, but we were unable to determine. But in spite of the awful infection in the neighborhood we secured good bony union, and the man has now a useful limb.

My experience in this case led me in the next cases I got to do the same thing. My idea is that one can put in a barrier of a slowly soluble antiseptic which will prevent the spread of this infection, and by putting a barrier in the case I have reported, the man lost only that which was infected. In a case in which there was an injury of the hand the process was limited to the hand, and the portions of the dorsum of the hand sloughed off. In a third case which occurred last winter at St. Luke's Hospital, the man, having received a double crushing injury of the feet, had following within forty-eight hours malignant edema. An attempt had been made to save the feet, because the circulation was good in the soft parts. There followed an acute malignant edema on one side. The opposite side was not infected with the organism. Inside of forty-eight hours after his admission, and about twenty-four hours after it was discovered to be malignant edema, the condition of the patient was so desperate that he was taken to the operating-room for amputation. I did not dare amputate the foot, because I felt sure he would die on the table if I did so. I asked one of my assistants to go to the drug room, boil in alcohol salicylic acid to saturation. I tried this again, and saved the life of a third patient. These are the only three cases I have had of malignant edema. Fortunately, these cases are rare. From the favorable experience I have had, I think any of you will be justified in trying this treatment.

4. RECURRENCE OF EPITHELIOMA OF THE LIP FROM THE USE OF THE X-RAY

While showing cases that have been benefited by the X-ray, and I have had many of them that have been fully protected and have gone on for six or seven years without recurrences, it will occasionally happen that we have a very decided recurrence. The case I now present to you is in this regard a phenomenally strange one. This man was operated on two weeks ago for epithelioma of the lip. The lower lip was removed throughout three quarters of its extent. Why was it removed? A year ago he had an epithelioma of the lip which was dissipated by the X-ray treatment in the hands of Dr. Pusey, but returning to Dr. Pusey with a small crust at the site of the old trouble, he again started the treatment. Instead of the X-ray improving the condition, it burst out afresh so that inside of twelve days the condition was most alarming. Here was a case in which under the use of the X-ray the growth seemingly disappeared, then suddenly flared up, and could not be made to disappear with the X-ray.

5. NEUROMA OF THE ULNAR NERVE

Dr. Daniel N. Eisendrath: The first case I show you is one of interest on account of its pathology and surgical treatment. This young

man entered my service last summer. He is fifteen years of age, and about three weeks before coming to the hospital he began to have pain and swelling on the inner side of the arm at the same location where he had been operated on twice before, once by Professor Senn, when seven years of age, and once at the age of four. Recurrence followed each operation. When he first presented himself here there was a spindle-shaped mass situated upon the inner side of the arm, which was about three to three and a half inches in length, and extended along the line of about the ulnar nerve, and seemed to have communication with the scar, which at that time was white. On touching one particular point in the scar it was found to be excessively tender. We made a diagnosis of a fibro-neuroma, with the suspicion, on account of its having grown rapidly, of possible malignant degeneration of the fibro-neuroma.

The question came up as to what to do for this boy.

These illustrations will show you what we found. Upon first making an incision, the first thing I did was to make an incision which included all the scar tissue and some of the neuromatous mass attached to the main tumor. Then there was exposed to view this tumor which we felt externally. It was distinctly a neuroma of the ulnar nerve, and I thought that it was all we had to deal with. But upon lifting it and dissecting it away from the ulnar nerve, I found there was a second tumor which lay beneath it, and which was attached to the median nerve. The relation of the two tumors is shown in the illustration which I will pass around. The first tumor was removed, and the second tumor exposed. When the two tumors were removed, the condition of affairs was as shown in this last illustration (exhibiting photograph). The operation showed that the condition of both nerves was about the same. If this (indicating) should represent one of the nerves, there was attached to it a tumor which was elongated and into which ran at least one half of the fibers of each nerve. Strange to say, in spite of the fact that a large number of these fibers ran into the nerve, there was no paralysis, nor any loss of sensation. The patient was carefully examined by Dr. Goodkind before the operation, and we did not find any evidence of either loss of sensation or motion. The problem was how to deal with this case. If I dealt with it as the pathology of these tumors teaches us, the only thing would be to resect the ulnar and median nerves and do a plastic operation. On account of extensive involvement of both nerves, having only the radial nerve to fall back on, I would have had a difficult task. I extirpated the neuroma as far as I could from the nerve to see whether there would be a recurrence. I did this by simply dissecting the tumors away. The result is shown in the illustrations. Following the operation he had complete loss of sensation and motion of the whole hand, but has gradually regained sensation and motion. This was about three months ago. There is impairment in flexion. He is working as a clerk. Sensation is perfect, and there is no reaction or degeneration. There is no normal resistance to faradic and galvanic electricity. If you put your finger over the arm like this (indicating), you will strike the neuromatous spots. At the time of the operation I found that the scar in the skin was attached by a number of fibers to the main tumor. I excised this completely, and the curious feature is that the tumor showed extensive myxomatous degeneration or a mucoid condition, so that when the tumor mass was opened, a large amount of jelly-like material escaped.

Dr. Maximilian Herzog: The pathology of neuroma can be dismissed with a few words. Most of the tumors called neuromata are not pure neuromata. Pure neuromata are exceedingly rare, and most of the tumors that have been diagnosticated as neuromata are not neuromata at all, but fibromata or fibro-neuromata. This is a case of fibro-neuroma, as the microscopical examination clearly shows. You will find a lot of loose connective tissue filled with edematous material, and then you find in various parts of the tumor nerve fibers. They are atypical, but they show the axis-cylinders and the white substance of Schwann, the myelin sheath. It is known that most of these tumors first show themselves in childhood, and they all have a tendency to recur after removal. These tumors are very uncommon in horses. They are not really malignant, and they can be likened to keloids. The latter, like the former, both in man as well as in horses, have a tendency to recur after removal, but they are not truly malignant, and they do not form metastases.

2. FRACTURE OF EXTERNAL CONDYLE OF HUMERUS

Dr. D. N. Eisendrath: The second case is a very interesting form of fracture. This young lady sustained a fracture of the external condyle of the humerus about twelve years ago. I did not see her until early this summer. The interesting feature about it is this: She has very marked cubitus valgus. She now comes to us to know whether anything can be done surgically. The cubitus valgus is very marked, and in addition to that, X-ray shows the external condyle to be displaced forward; the radius has been carried with it, as you can see by an examination of the

arm, so that the question comes up as to whether operative interference will be of any avail. A skiagraph shows the external condyle displaced forward, so that it interferes somewhat with the motion of the joint. The radius has been carried forward with the external condyle.

3. TREATMENT OF FRACTURES OF THE NOSE WITH A NEW SPLINT

Along the line of fracture, lately we have had a very agreeable experience with a splint in the treatment of fractures of the nasal bones. With the aid of one of the instrument houses in this city I have made a slight modification of the original splint suggested by Cobb and Coolidge, of Boston. You know how difficult it is to keep dressings for nasal fractures in place, and especially in patients whom one must treat in an ambulatory manner and sometimes does not see for a few days. I have used this splint in four cases; Dr. Greensfelder has used it in several, with excellent results. I have made a modification in the adjustment of these screws. We found it would slide off the nose at times, so that I use a little fixation apparatus over the lower portion of the splint. This can be adjusted to each patient. These pads, which you see, are placed on each side of the nose. The illustration of the original splint by Coolidge is given in Scudder's book on Fractures, and the splint is not only adapted for those cases where there is an actual fracture of the nasal bones, but where the lateral cartilages have been separated from the nasal bones and sprung out. It can be so adjusted that it will stay on quite firmly. We let the patient apply it for about half an hour to an hour in the morning, and about the same length of time in the evening. It is especially suited to those cases in which there is a separation of the lateral cartilages from the nasal bones, and in those cases where there is great tendency to displacement. We correct deviations of the nasal septum which are quite frequent in these cases.

4. BISMUTH IN THE DIAGNOSIS OF STRICTURES OF THE ESOPHAGUS

I want to show you the use of bismuth in the diagnosis of strictures of the esophagus. I have here three skiagrams of cases of strictures of the esophagus. One patient was shown about two years ago before the Chicago Medical Society. This is the skiagram from the case of a gentleman who had a syphilitic stricture of the esophagus, and died at the Alexian Brothers' Hospital. The skiagram shows dilatation above the point of stricture, the bismuth giving rise to a shadow very deep in contradistinction to the rest of the picture, showing trickling of the bismuth down opposite the stricture in the esophagus. The method of doing this is to let the patient eat bismuth with bread, or make a thick emulsion with water and let him swallow it.

The second skiagram shows in a very clear manner the use of bismuth. The bismuth is shown high up in the esophagus. It shows also lower down. We see a trickling of the bismuth, showing a great narrowing of the esophagus as we get down farther. A third case is also very typical, showing the bismuth extending down into the esophagus the normal width, and then stopping at the bifurcation of the bronchi and does not begin again.

5. FRACTURES OF THE METACARPAL BONES

At a previous meeting of this Society I showed several cases of fractures of the metacarpal bones. Since then I have run across in my own practice several more, and thanks to Drs. Ridlon and Ryerson I am able to show photographs and skiagrams of some more. I will pass these pictures around. Here is a case of Dr. Ridlon's, showing extreme deformity, with fracture of the first, second and third metacarpal bones. The picture here of the so-called Bennett fracture, or fracture of the metacarpal bone of the thumb, is that of Dr. Ryerson's case. The rest of them are all our own.

This picture is particularly interesting. The man sustained a fracture of the head of the metacarpal bone of the index finger by the crank of an automobile, and it was impossible to recognize any injury without the use of the X-ray. This picture was taken four weeks after the injury and shows a typical fracture. At the same time, I want to pass around prints of fractures that are so difficult to recognize without the aid of the X-ray — fractures of the phalanges, and show a number of patients with fractures of the metacarpal bones. Some of these were shown before. The fractures of the metacarpal bones are transverse and spiral, and may occur most frequently in the shaft of the bone. Here is a fracture of the first and second metacarpal bones. We make it a practice in every injury, no matter how slight it is, to take an X-ray, because we run across so many fractures of these bones. Here is a fracture of the metacarpal bone of the little finger; here is another fracture of the metacarpal bone of the index finger from the automobile accident. In this connection I would like to urge and suggest the taking of X-ray pictures in two different directions, as it is impossible to determine or to judge of the amount of anterior and posterior displacement without a second picture. I show you a typical fracture now of the

metacarpal bones following a crushing injury of the hand; another of fracture of the phalanges, so-called baseball finger, treated as a sprain at first, in a boy, until the X-ray showed it to be a fracture of the first phalanx of the thumb.

DISCUSSION ON THE CASES PRESENTED AND DEMONSTRATED

Dr. Arthur Dean Bevan: I was very much interested in the first case shown by Dr. Greensfelder of injury of the foot, where no amputation had been made, and where the tissue had been allowed to slough off. The question occurred to me at the time as to the future of that foot from the standpoint of usefulness. I am quite in sympathy with the conservative handling of these crushing injuries of the hand and foot, and this is a beautiful example of what can be done by conservative treatment; at the same time, there are certain facts that confront one in a case of this kind that must be met from the standpoint of the future usefulness of the limb. First of all, as it is now, there will be a large scar eventually at the point of pressure which will probably break down rather readily under friction of a shoe, so that I do not believe that leaving the limb as it is would be a good plan. From some experience in railroad surgery, it occurs to me, and it is my impression, that the best way of handling that foot would be now to make a Pirogoff. If a Pirogoff is made (and there seems to be plenty of tissue), it would do away with this large tender scar. It would leave a useful limb — in fact, a much more useful foot than he can possibly have with the present foot. The question might be raised as to whether a Pirogoff is preferable to an amputation at the junction of the lower and middle thirds and the wearing of an artificial limb; but I believe, from my experience with a number of Pirogoffs, that would be the best way of handling this case.

Dr. Carl Wagner: I was very much interested in the method described by Dr. McArthur of walling off the point of infection in these cases of malignant edema with salicylic acid. Prof. v. Nussbaum used to inject carbolic acid for the purpose of walling off infection in these cases, especially in erysipelas, but so far as I remember, it was only a success in a few cases. I am glad to know that salicylic acid boiled in alcohol and used in the manner Dr. McArthur has described has been so successful, and it can be recommended for further trial.

Dr. Samuel C. Plummer: There is one thing I noticed in the skiagrams of dilatation of the esophagus in cases of stricture, and that is, they all seem to be high up in the esophagus, whereas we know the great number of cases of stricture of the esophagus occur near the lower end. It seems strange that Dr. Eisendrath should have three cases in succession with the stricture so high up.

Dr. D. A. K. Steele: With reference to the second case presented by Dr. Greensfelder, the case of neoplasm of the kidney in a young child, the lesson we should learn from that and all other cases of neoplasms of the kidney, particularly sarcomas, is that we should not only be taught to make a diagnosis, but be taught not to operate. The operation does no good. From the experience I and others have had, who have operated on young children with kidney tumors of a malignant type, with sarcomatous changes, it has been found that the operation is only beneficial for a few weeks or a few months. Usually, operation is promptly followed by death. In these cases many of the tumors are prenatal; they exist before the birth of the child, and when young surgeons are called in to see a child a year and a half or two years old, with a large rapidly growing abdominal tumor, the question of differential diagnosis appeals to them, particularly in a female child, and I used to believe that after having made a diagnosis of embryonal tumor of the kidney, an early operation is likely to be beneficial, but after an experience with three or four of these cases and finding a uniformly fatal termination within a year after operation, I have desisted and contented myself with making the diagnosis, but giving an unfavorable prognosis. These patients are likely to die within a few months. In this particular case that has been presented we have the anatomical abnormality of horseshoe kidney, and it was difficult to differentiate as to whether it is a tumor of the kidney or of the mesentery, which adds to the interest we have in the specimen. I would like to have Dr. McArthur speak in his closing remarks with reference to the depth of the injection in cases of malignant edema.

Dr. Max Reichmann: I wish to say a few words in reference to what has been said by Dr. Eisendrath about bismuth. The use of bismuth in finding strictures of the esophagus is not very good. We prefer to use hollow tubes that are filled with mercury and which are introduced into the esophagus, and show a beautiful picture. Furthermore, Müller, in Hamburg, manufactures a tube that is now made out of rubber combined with lead, which is introduced into the esophagus and leaves a clear shadow.

A few words with reference to the case of the boy with an affection of the neck, presented by Dr. Greensfelder. A picture shows clearly some bony neoplasm in the region of the atlas and epis-

tropheus, but the nature of the disease cannot be determined by the X-ray. It is similar to a syphilitic neoplasm; it has a similarity to a tubercular neoplasm, but its most striking similarity is to arthritis deformans hypertrophica, as we so often find it in the hip-joint.

Dr. Edward H. Ochsner: In reference to the case reported by Dr. McArthur in which he resected several ribs followed by pneumothorax, the question arises whether it is desirable to aspirate the air or not. About eight weeks ago I resected the greater portion of the left eleventh rib for pressure neuritis of the intercostal nerve due to scoliosis, and contrary to all anatomical text-books the pleural cavity extended about an inch and one half below the lower border of the twelfth and eleventh ribs, consequently I opened the pleural cavity for a long distance. After closing the wound carefully the question naturally arose in my mind as to whether or not it would be desirable to aspirate the pneumothorax. I have followed the rule that when a patient is getting along well to let him alone. This patient did not seem to be discommoded in the slightest by the pneumothorax, and consequently interference did not seem warranted. It taught me that letting air into the pleural cavity and leaving it in is not a serious matter, and that aspirating it is a procedure which is not entirely without risk and certainly seems unnecessary, for sterile air is absorbed in a very short time.

In reference to Dr. Eisendrath's case of neurofibroma I wish to briefly report a case which came under my care about four weeks ago, which suggested to me the possibility of using alcohol injections in the treatment of these recurrent growths. The patient in question came to the hospital after having had seven operations for painful neuromas of the brachial plexus, following an injury to the brachial plexus by having a tree fall on his shoulder. Practically everything had been tried, including repeated resections of the nerves and osmic acid injections. It occurred to me that it might be well to try the treatment which Dr. Patrick has popularized in this city for trifacial neuralgia. I took a hypodermic needle and injected about 2 c.c. of 70 per cent alcohol into each painful spot. The patient assured me that he has had much less pain since this little operation than he had previously. Possibly the pain will recur, but if it does the little operation can be repeated once a month with less discomfort to the patient than his constant excruciating pain, and with less danger than if he should become a morphine habitue.

Dr. L. L. McArthur: To answer Dr. Steele's question, I would say that an effort was made to entirely surround both by deep and superficial injections the area of invasion with the malignant edema; that in each of these cases the extension of the gangrenous process stopped before it reached this line of injection, and the tissues, which were infected, invaded, swollen, edematous and red, began to subside and later sloughed off, as shown by the loss of tissue in the case presented, and, as I had hoped to show, by the cases that promised to be here, but did not come.

As to Dr. Ochsner's statement with reference to doing something unnecessary, I would say that there is no danger of puncturing a lung collapsed by the condition which obtains with a pneumothorax, especially if that needle be of the type which should be used; that is, with guarded point, such as originally was sold with the Allen surgical pump, there would be no danger of injuring the lung. A lung in a normal condition is an expanded lung and not a collapsed one, and it is certainly acting up to the light that we have when we try to bring a lung back into something like its normal condition. It is not a condition similar to that recommended by Dr. Murphy, where the lung itself must be put at rest. The respiratory apparatus has been disturbed by the operation very decidedly, and collapse of the lung might easily harm were it allowed to remain unnecessarily long. As it is not necessary, I believe it is wise to reduce the amount of air in the pleural cavity. I do not believe it can all be aspirated, but an approach to the normal may be had.

Dumreicher, of Vienna, appreciated the anatomy of the pleura when attempting to suture the kidney to the last rib. He found by a fatal case that he sutured through the pleura. A septic pleuritis had followed the sepsis of a surgical wound which occurred in the suspension of a kidney from the twelfth rib.

Dr. Louis A. Greensfelder: I quite agree with the statement made by Dr. Steele that in a case of sarcoma of this type it would not be wise to operate and remove the kidney; but if Dr. Steele recalls the presentation of the case, he will doubtless remember the fact that we were not at all sure it was a neoplasm. On the contrary, my colleagues, who examined the child carefully, also believed it was hematoma, and not a neoplasm of the kidney. They believed it was not malignant.

The case was shown very largely for the purpose of illustrating the difficulty of making a differential diagnosis in cases of this kind where we have absolutely nothing but a history of traumatism and a gradual swelling.

In answer to the remarks of Dr. Bevan, I will say that if we found the line of demarcation the

foot would have to be subjected to radical surgical interference. We thought it wise, however, to give the child, for the time being, the benefit of a doubt, and I do not think such a scar will prevent the proper fitting of a shoe.

With reference to what was said by Dr. Reichmann, I will say that I had hoped some of the members would enable me to make a differential diagnosis in the case presented, as to whether it was one of arthritis deformans or tuberculosis. Personally, I am unable to make a differential diagnosis between the two conditions.

Dr. D. N. Eisendrath: With reference to the point made by Dr. Ochsner, we found out last summer, when we studied the matter of pleural reflection in relation to the treatment of subphrenic abscesses, that the old teaching in regard to reflection of the pleura was erroneous, and only one of the later books on anatomy gives the correct reflection of the pleura, and that is Cunningham. We dissected a portion of formalized cadavers and found the pleura extending much deeper than we have been ordinarily taught, and that it included the greater portion of the twelfth rib, coming down to the twelfth dorsal spine, much deeper than we have been accustomed to think of it.

Dr. Maximilian Herzog: The specimen I here show you is from the neck case described by Dr. Greensfelder. At first, the tumor grew slowly, and not until recently did it begin to grow rapidly. Dr. Greensfelder was under the impression that it was a perfectly harmless, non-malignant tumor. Examination, however, showed that it probably arose originally from a benign lymphangioma cysticum. You will see under the microscope cystic spaces, but these are separated from each other by bridges of embryonal connective tissue; hence it looks as if the tumor had become malignant.

As to the next case, I will say that a provisional diagnosis only has been made. The patient was a girl, virgin, 23 years of age, who, for the last six weeks or more, had headaches, irregular pains, but during the last month these symptoms became more acute. She complained of severe headaches over the entire head. These were persistent and continuous. There was no particular tenderness elicited on pressure. She complained also of severe pain in the upper dorsal and lower cervical regions. It was with difficulty that she could flex the head on account of the severe pain it caused. She believed that her condition was due to catching cold, attributed to exposure and wet. Her past history was negative. Ophthalmoscopic examination, made by Dr. Snydacker, revealed intense papillitis.

The post-mortem diagnosis was as follows: Hypertrophy of the myocardium, particularly on the left side; atheromatosis of the beginning of the arch of the aorta and of the beginning of the coronary artery; fibrous adhesions of the lungs and passive congestion; hypertrophy of the spleen, with perisplenitis at the upper surface; cyanosis of both kidneys and liver; old fibrous cicatrices in the cortex of the right kidney; hemorrhage at the pons and into the meninges, medulla, cervical and thoracic portions of the cord, from rupture of an aneurysm or aneurysms at the base of the brain.

In making a microscopical examination I found that the internal organs, particularly the liver and kidneys presented such changes as might be designated as a moderate fibrosis, moderate increase of interstitial connective tissue, and at the site of the hemorrhage I found the following condition: The vessels of the pia arachnoid, particularly the veins, show a periphlebitis and mesophlebitis, and occasionally you will find a periarthritis. Bacteria were not found. What was the cause of that condition?

My provisional diagnosis was lues hereditaria tarda. Aside from that, I could not make any diagnosis. We have atheromatous changes in the large vessels; we have moderate fibrosis in the liver and kidneys; we have these changes in a woman who did not have acquired syphilis; she was a virgin, as the post-mortem examination showed. She had no signs of acquired syphilis, and we had rupture of an aneurysm at the base of the brain, as I think, in consequence of late hereditary syphilis.

I have some more specimens here which I would like to show, but time is getting short, so I only want to call your attention to a tumor of the brain, which is a true sarcoma and not a glioma. The last microscopic specimen shown is from a case of congenital syphilis. The child lived about a day. The sections are silvered by Levaditti's method. They show innumerable beautifully outlined spirochetæ pallidæ.

DERMOID

Dr. L. L. McArthur: A young girl, 12 years of age, was sent to me through the kindness of a colleague, Dr. O'Neill, with a diagnosis of appendicitis of severe type, requiring immediate operation. The history is interesting in that it brought up a question of diagnosis. I report the case to get the assistance of the Fellows as to any similar experiences they may have had. As elicited, the history was this: Five weeks before the patient had had the mumps; at the end of six or seven days she was seized with a sharp

pain in the right abdomen, with a recrudescence of temperature, and other symptoms which attend abdominal inflammatory trouble, such as vomiting, nausea, some intestinal obstruction, tympany. These subsided after four or five days, and again, within ten days, were followed by more pain in the abdomen. The second attack lasted forty-eight hours. A third attack, five weeks after the original mumps, was the one in which I saw the patient. At that time her temperature ranged from 102° to 103°, with pulse above 110, with a leucocyte count of 27,000; with rigid abdominal wall over the right lower quadrant; with no tumor to be felt over the abdomen; but by rectal examination a boggy tender mass to be felt in the right side of the pelvis. The next question was to decide whether we had really an appendicitis, a pelvic abscess from a tube, an inflamed ovary from the mumps, or some rare affection. I made the diagnosis of a probable appendicitis, but with the reservation that we might find an inflamed ovary as a result of the mumps, enlarged and swollen. What did I find on operation? A thickened, adherent, non-inflamed appendix in the outer gutter, kinked, and bound down by old adhesions. There was no former history of appendicitis. Satisfied that it was not the source of the trouble, I searched further, and found a condition of the small intestine, near the ileo-cecal valve, like this: A blunt projection, larger than the thumb, and longer than the thumb, projecting from the ileum. This was not inflamed, with no bands, and no mesentery, a typical diverticulum of Meckel, and yet being uninflamed, I pushed that aside, and searching in the pelvis found this large gangrenous tumor which proved to be an ovary with twisted pedicle. I removed the ovary, inflamed and gangrenous. It was a dermoid. Now, was it possible that in the dermoid, dormant there, the mumps made sufficient inflammatory reaction in the remaining ovarian tissue to cause it to swell, and, with the alternate emptying and rising of the bladder, made it twist? For we had a twisted ovarian tumor as the result of the dermoid which had been brought into an active inflammatory condition from the mumps.

Dr. L. L. McArthur: With reference to the tumor of the brain presented by Dr. Herzog, and in which he made a provisional diagnosis of late hereditary syphilis, I will say that the diagnosis was attended with great difficulty. It was impossible to tell whether there was a tumor of the brain or not. In fact, I was asked by one of my colleagues on the staff to make an exploratory operation for tumor of the brain, but felt inclined to refuse, as it did not seem quite fitting when the clinical history was considered. During the night of the following day, when I saw her, she sat up in bed and suddenly died. A post-mortem examination was made the next day and showed hemorrhage within the dura, extending down into the spinal canal, covering the base of the brain, some of it old and some of it new, as I recall, so that it seemed to me to answer more nearly the history of a case of pachymeningitis hemorrhagica interna than any other diagnosis which we could make clinically. The specimen was left with Dr. Herzog to work up, and, as I understand, a small aneurysm was found at the base of the brain. I do not understand how various clots of various ages could have made this aneurysm and produced the headaches from which she suffered.

Dr. Herzog: There was no distinct aneurysm found. There were atheromatous changes and luetic changes in the vessels, as shown in the sections. It was shown by Rieder a number of years ago that the vascular changes in syphilis are meso-, para-, and endophlebitis and vasculitis, and only occasionally endarteritis, paraarteritis, and meso-arteritis. These are the changes found in the pia vessels. We have in the kidney and liver fibrosis. I have good reason to believe that the case was one of late congenital lues, or syphilis hereditaria tarda of Fournier. I did not find a distinct aneurysm there, but I believe there must be one there, as she had successive hemorrhages. The blood clot shows the following: Under the microscope it shows blood corpuscles and hematogen, one of the derivatives of hemoglobin; hence it is shown by the hematogen that the clot must have existed a week or ten days. It is clear to me that the woman bled from small aneurysms for eight or ten days, and that her headaches and symptoms were due to that slow hemorrhage, and finally the hemorrhage was so great that she died.

Dr. Carl Wagner: Dr. McArthur's case of dermoid cyst of the ovary complicated with appendicitis in a patient suffering from mumps recalls to my memory a case that occurred in my own practice in which Dr. Green was called in consultation. The patient was a girl, 15 years of age, who had suffered from tonsillitis a few days previous to my first call. At nine o'clock in the morning she was seized with a very severe pain in the abdomen, on the right side, at McBurney's point. The pulse was rapid, respiration very frequent; temperature 104°. I made a diagnosis of appendicitis. Consultation two hours after corroborated this diagnosis. The patient became weak very rapidly, the onset and progress of the attack being of a fulminant and destructive character. On opening the abdomen a large amount

of sero-sanguinolent fluid escaped. The appendix was found slightly adherent, but a mass which I brought from way down out of the pelvis proved to be a dermoid cyst of the right ovary, which had ruptured and caused an enormous hemorrhage and septic peritonitis.

In regard to dermoid cysts being prone to simulate appendicitis, I would like to cite another case the specimens of which I exhibited at the last meeting of the North Side Branch of the Chicago Medical Society. In this case a chronic appendicitis had been suspected by the patient and her doctor, while a nerve specialist pronounced the ailment one of mere nervousness and advised prolonged country sojourn as treatment. I found a very large dermoid cyst on the right side which floated between the intestines so that it easily escaped bimanual examination through the thick abdominal wall. During the operation we spoke of the great scarcity of doubled dermoid ovarian cysts. Almost ready to close the abdominal cavity, I once more brought up and examined an apparently normal left ovary, and had a good view of a tiny little cyst of the ovary about the size of half a bean which I had regarded as absolutely innocent. My attention and suspicion that something more than an ordinary condition might be present was aroused by the bluish hue of this little cystic body. A nipping of its thin membrane caused a few hairs to make their appearance. We removed it and found it densly filled with hair. Thus the somewhat rare pathological condition of a doubled ovarian dermoid cyst existed. Kelly, in his book on Gynecology, records out of 24 dermoid cysts of the ovary only one where this condition was present on both sides.

MEETING OF THE CHICAGO GYNECOLOGICAL SOCIETY, SEPTEMBER 20, 1907

DR. JUNIUS C. BOYD, Recorder
DR. FRANK W. LYNCH, Editor

EXHIBITION OF SPECIMENS BY DR. CHARLES B. REED

FETUS COMPRESSUS

Patient aged 36, pxiv. Delivered in the Chicago Lying-in Hospital service in July, 1907.

No history of twins previously. The mature child was born living and weighed 12½ pounds. The fontanelles were almost closed. The "fetus compressus" measures 4 c.m. x 2.5 c.m. and was approximately two months old at the time of death. There were no external manifestations of the death of the fetus that could be learned from the patient.

Frequency. In one series four instances were observed in 475 cases of labor, one fetus being macerated or decomposed, the other normal.

Causes of death in these cases may be summarized as follows: 1. Interference with circulation. 2. With single chorion, for instance, the conditions regarding nourishment are quite difficult; and one egg must suffer. 3. One twin grows faster and absorbs the nourishment of the other. 4. One egg may be accidentally injured, as by a knot in the cord, or by disease, and slow death follows.

Post-mortem Changes. The liquor amnii is absorbed. The fetus is compressed flat. The post-mortem changes are most pronounced the earlier in the pregnancy the death occurs. Sometimes the twin egg is found merely as a yellowish or white flake, and might possibly be mistaken for an infarct on the placental margin.

These cases of course are not certainly diagnosed, but the larger ones may be definitely differentiated. In later months the child's bones resist compression after death and a macerated child will be found.

When the injury is not mortal we find cases of deformity such as acardia, acephalus, etc., depending on the time, the location, and the extent of the injury.

The effect on the pregnancy may or may not be pronounced. Occasionally the pregnancy is interrupted, but usually the patient goes to term. Transient hemorrhage may occur at the time of fetal death, but the diagnosis can only be made after labor, when the time of the hemorrhage and the size of the dead fetus can be correlated.

In labor the dead twin sometimes presents and causes difficulty in diagnosis, or two babes from triplets may be compressed, as Bock and Reuss have observed, while V. Lichen reports the case of a fetus papyraceous that was born before its fellow. Bouchacourt reports the birth of a fetus papyraceous in the third stage. Becker saw one ex-

pelled on the fifth day after labor. Goldberger reports the smallest case on record, the fetus measuring 2.5 c.m. x 1.3 c.m. with a weight of 35 grams. The mature child showed an amniotic skin defect in the axillary line.

The practical significance of these cases rests in the fact that the compressed fetus may remain unnoticed in the uterus after the expulsion of the living child. Cases have been reported where the woman died of postpartum hemorrhage and the post-mortem revealed a retained "fetus compressus" as the cause of the atony.

REPORT OF A CASE

Dr. Rudolph W. Holmes: I wish to report a case of perforation of the cervix, rupture of the bladder, with its separation from its uterine attachments. Last Sunday afternoon, September 15th, a woman was admitted to my service at the Passavant Hospital. The interne discovered a transverse presentation with a prolapsed cord and hand. The right labium was much contused and distended with a hematoma. A broad deep cut extended from the labium nearly to the cervix. The patient was in collapse on admission, rapid pulse, and bathed in a cold clammy perspiration. When I examined the woman I found the opening through the cervix admitting two fingers; without the cervix I could pass my hand easily between the bladder and uterus. The retraction ring ran obliquely across the abdomen at and above the navel. In a few moments the woman was delivered by decapitation: the uterus was packed with chinosol gauze. Between three and four hours later, as she had rallied somewhat, aided by Dr. Brougham, a hysterectomy was done, and the rent in the bladder repaired. Unfortunately she died a few minutes after being returned to bed.

The history of the case is meagre, and inconsistent with the lesions found. The husband insisted the midwife had merely examined, and, discovering the pathological condition of the presentation, asked for a physician. The physician who sent the woman to the hospital declares he did not attempt delivery — merely insisted that she go to the hospital; at the time of his visit to the patient he found the lesions described. He further states that while he was arguing with the family over the necessity of hospital care the woman suddenly collapsed.

Another case I had recently in the Lying-in Dispensary service was of rupture of the cord intra partum. Some two years ago this patient had been delivered spontaneously of a baby, which weighed on the dispensary scale just under fourteen pounds. Immediately after expelling the child she collapsed and almost died. About two weeks ago she fell in labor again. The interne recognized a transverse presentation with the hand and cord in the vagina. I did a version and extraction. When the legs were brought down the cord was found between the thighs; the cord was easily freed. The extraction was not attended with any particular difficulty. When the child was delivered the cord was found severed about an inch from the navel. The woman and child both lived.

Dr. De Lee: One interesting thing about the ruptured uterus case was that the symptoms of uterine rupture were not present even when the uterus was ruptured.

Dr. Holmes: The woman was in collapse when I saw her; while the doctor and family were discussing her going to the hospital she suddenly developed symptoms of collapse. I might say that it is a question what produced the traumatisms, especially the vaginal and vulvar ones. Probably the midwife had attempted to deliver her, even perhaps, with forceps, and when she saw the alarming symptoms she asked for help, and intimidated the family so that they denied that she had attempted delivery. It is possible that the bladder and uterine ruptures were due to spontaneous causes; it is hardly possible, very improbable, that the external lesions could occur spontaneously.

Dr. Bacon: As I understand it, this rupture did not extend through the peritoneum.

Dr. Holmes: The rupture was in the intravaginal portion of the cervix, almost completely separating the bladder from the uterus; the peritoneum was ruptured between the bladder and uterus. The rupture was not in the lower segment as we usually find spontaneous ruptures.

Dr. Bacon: I would like to ask what was the direction of the tear. Was it longitudinal?

Dr. Holmes: No, it was a transverse tear.

Dr. De Lee: The determining effect of tears of the lower segment from the retraction ring is, physiologically, that the retraction ring ought to disappear.

Dr. Holmes: This was not a rupture of the uterine body, it was in the cervix and surely must have been traumatic. I cannot conceive of these external traumatisms having been produced spontaneously, but the midwife had intimidated the family so they were afraid to tell what had happened.

Dr. Schmauch then read a paper entitled Physiology of Extra-Uterine Pregnancy.

Discussion of Dr. Schmauch's Paper.

Dr. C. S. Bacon: I would like to ask for some consideration by Dr. Schmauch of one of the

points he brought out on a most interesting subject. What, so far as we know, is the essential nature of the tissue in which the ovum is imbedded? The oviblast does not grow everywhere, and whether it grows in the uterus or in the tube, it grows on certain tissues, derived from the Mullerian ducts. I understand Dr. Webster's contention to be that in case of ovarian pregnancy there is probably some inclusion of Mullerian tissue. I do not know that that would be contradicted by the facts brought out by Dr. Schmauch to-night, that the ovum may be imbedded outside the graafian follicle on the surface of the ovary. I would like to hear the essayist discuss that subject, which is, theoretically at least, of considerable interest, and I would like to hear his opinion in regard to the contention of Dr. Webster, that it is probable in cases of ovarian pregnancy the ovum is still implanted in the tissues in the Mullerian tract.

Dr. J. B. De Lee: One interesting point brought out by Dr. Schmauch is the formation of the covering of the hematocele of extra-uterine pregnancy. It has occurred to me the wall of the hematocele is formed of the fetal elements, of coagulation necrosis.

Dr. George Schmauch: In regard to Dr. Bacon's question, I will say I made the statement that besides ovarian pregnancy as described in my case, there is an intrafollicular development of the ovum. We have thought for a long time that the ovum could not be imbedded unless there was some epithelium present, but this has been disproven. We rather expect to find that the epithelium has to be lost before implantation becomes possible. Implantation of the ovum is not possible but in subepithelial tissue. It may be the stroma of the uterine mucosa, or the peritoneal layers, or the ovarian tissue.

Dr. Bacon: I think I did not make myself clear. I suppose it is now admitted that the epithelium is not essential, but at least some elements of the tissues derived from the Mullerian tract seem to exist in the great majority of all cases of nidation. It seems to be thoroughly well established that, with the possible exception of the tissues in the ovary, the egg cannot live on stroma or connective tissue from other parts of the body; for instance, the mucous membrane of the intestinal tract or any other part of the body. What is the reason? I understand that Dr. Webster holds that the only suitable soil for the growth of ovular trophoblast is tissue of the Mullerian tract. Does Dr. Schmauch regard this supposition disproved?

Dr. Schmauch: As far as I know Dr. Webster is the only one who believes that. No doubt there are some cases reported where the ovum is buried under the peritoneal surface, — that is thoroughly established. In my opinion the ovum can establish itself anywhere independent of the Mullerian tissue.

Dr. Bacon: The vaginal tissue, for instance.

Dr. Schmauch (in closing): Not on the vagina, because it is covered with squamous epithelium and communicates with the open air, but in the abdominal cavity.

In regard to Dr. De Lee's question, I will say that I have myself examined some membranes formed of hematocele and it is very difficult to decide what kinds of cells they are, but I am inclined to join in the opinion given lately by Macunet, that these cells are probably derived from the tubal wall. They are fibroblasts that are forced out of the continuity of the tube by pressure developed inside of the blood coagulum. Most cases of hematocele are brought on by tubal abortion and small masses of connective tissue of the mucous membrane which bulge out might afterwards get in connection with the peritoneal surface. The irritation of the fetal cells upon maternal tissue has some influence also. No doubt the blood coagulum, itself, brought into the abdomen is, as experiments show, not enough to produce such adhesions.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

JOHN B. MURPHY, M. D.
FREDERIC A. BESLEY, M. D.
E. WYLLYS ANDREWS, M. D.
WM. K. [illegible] M. D.

THE PARATHYROID GLANDULES. THEIR BLOOD SUPPLY, AND THEIR PRESERVATION IN OPERATION UPON THE THYROID GLAND. By William S. Halsted, M. D., and Herbert M. Evans, S. B.

Dr. Halsted is convinced from a long series of observations made on dogs in 1889 and 1906 and 1907, that if the blood supply of the thyroid or the parathyroid glands be cut off, the glands thus deprived of their circulation will probably die. More cases of operative tetany have occurred in the past two or three years than during the quarter century preceding. This is due primarily to the frequency in these years of operations for exophthalmic goiter and, perhaps, secondarily to the fact that surgeons have considered the non-removal of the parathyroids a guarantee that tetany would not supervene on operation. Dr. Halsted believes, however, that the parathyroid glands might, possibly, better be removed and transplanted into the vascular thyroid than, being deprived of their arterial supply, be left in situ in the neck, with the hope that vascularization and function would be restored. "It is in the control of hemorrhage that we sacrifice the parathyroid glandules. But the hemorrhage must be controlled and thyroid vessels must be divided somewhere in the operation for the removal of a lobe of the thyroid gland. May they be so divided and secured as not to cut off the blood supply of the parathyroid bodies?"

To decide this question Dr. Halsted enlisted the assistance of Mr. E. H. Evans, of the class of 1903 of the Medical School of the Johns Hopkins University, who contributes the findings in a series of unusually successful injections in man of the thyroid and parathyroid arteries. A tiny artery was found to supply the parathyroid glands in every instance. In ten individuals an inferior thyroid artery was observed nineteen times; a superior, twenty times or in every instance. Hence the absence in man of a parathyroid gland is a definite anomaly, and we may expect to find with great constacny four parathyroids in each individual. In six instances the inferior parathyroid gland was below the lower pole of the thyroid.

The location of the parathyroid glandules in man is in general much lower than in dogs, the higher of the two glands of one side being on an average about at the level of the junction of the upper and middle thirds of the thyroid lateral lobe. The lower of the two glandules is rarely as high as the middle of the thyroid lobe. With great regularity these little epithelial bodies were found about the posterior border of the thyroid lateral lobe and more or less in line with a vessel which Mr. Evans describes as a "channel of anastomosis" between the superior and inferior thyroid arteries.

Dr. Halsted writes that it is only with the exercise of the greatest caution that the parathyroid arteries can be spared in the operation of thyroid lobectomy, for "between the point at which the branch giving off the parathyroid artery enters the thyroid lobe and the origin of the latter vessel there may be barely room for one fine-pointed artery forceps and not space for a broader-nosed clamp, and still less for two clamps." On two occasions there was not room for even the fine point of a "mosquito clamp," and hence Dr. Halsted in one case deliberately ligated the inferior parathyroid artery and transplanted the parathyroid gland, seeing no alternative save preserving a portion too considerable of the thyroid lobe. On several occasions in the human subject, and frequently in dogs, Dr. Halsted has transplanted parathyroid glandules into the thyroid gland.

The operation advised by Dr. Halsted for the preservation of the parathyroids is that of ultraligation or ligation beyond the origin of the parathyroid arteries. A detailed description of this operation is given in the paper. If this view is correct, operations which aim merely to leave the parathyroid glandules in situ and take no heed of the parathyroid arteries will frequently, if not usually, cut off the blood supply of the parathyroid bodies and thus presumably effect their destruction.—*Annals of Surgery*, October, 1907.

THE DISPOSITION OF THE APPENDIX STUMP. Illustrated. By Benjamin Merrill Ricketts, Ph. B., M. D., LL. D., Cincinnati. Read before the Mississippi Valley Medical Association, Columbus, O., October 8–10, 1907.

This subject is dealt with from two viewpoints.

First — The consideration of the various methods of disposing of the stump.

Second — The cause of hemorrhage and its frequency. In response to circular letters sent to a number of surgeons, sixty-four replies were received representing 80,251 appendectomies with an average mortality of seven and one-half in acute and one and three-quarters per cent in chronic cases.

Eighty per cent of the total number of operations reported have been done by the four purse-string methods. The acute and chronic cases were about equal in number.

The various per cents of different techniques used is given. Also the per cent of cases in which the different ligatures and sutures of catgut and linen were used.

About sixty cases of hemorrhages from the stump are mentioned, forty of which are tabulated in detail, giving eleven deaths. Of the total number of hemorrhages mentioned, all but one have resulted in the purse-string methods. The technique of each of the sixty-four surgeons reporting is given briefly.

Investigation of this subject shows that many operators have abandoned the purse-string methods; that others are doing so; that simple ligature for the firm and extirpation for the soft appendix are the safer methods, and that any other than simple ligature and extirpation with linen or silk for ligature or suture should be condemned absolutely.

There are five illustrations showing the vascular supply to the cecum appendix and mesocolon, and thirteen giving the various forms of technique.

B. M. RICKETTS.

WOUNDS OF THE INTESTINE AND MESENTERY BY BLUNT FORCE. By Dr. Josef Hertle, from the Surgical Clinic in Graz. Prof. W. Hacker, Director.

Hertle quotes 154 cases, of which 9 came under his personal observation.

Etiology.

I. Circumscribed point of contact. 92 cases.

1. Of 140 cases, 41 (or 29%) were caused by kicks of horses.

2. Blows or crushing by wagon-poles were a relatively frequent cause.

3. Two cases were caused by boards springing away from circular saws.

4. Five cases followed blows from falling boards.

5. Falls upon pointed objects in 5 cases.

II. Broad point of contact. 34 cases.

1. In 11 of the 140 cases the cause was a "run-over" accident.

2. Crushing force — as between the buffers of railway coaches, a wall and an elevator, etc. 10 cases.

3. Falls. 14 cases.

Predisposing Factors.

1. Occupation: laborers, 32; factory workers, 20; farmers, 7; soldiers, 3; other trades, 9.

2. Sex: men, 124; women, 4.

3. Age: only 4 cases of children are noted.

4. Anatomic conditions:

a. Weak and loose walls, as in old people.

b. Pathologic fixation of portions of the intestine following inflammatory processes.

c. Hernia increases the danger.

Pathology.

1. Localization (as noted in 123 cases):

Small intestine	31	
No more accurate location given.		
Duodenum	12	
Jejunum	29	
Ileum	40	
Total small intestine	112	= 92%
Cecum	2	
Colon ascendens	2	
Colon transversus	2	
Colon descendens	1	
Flexura sigmoidea	3	
Rectum	1	
Total large intestine	11	= 8%
Total	123	

2. Frequently occurs the entrance of intestinal contents into the retroperitoneal tissue and subsequent phlegmons. These may extend along the spine into the pelvis or into the perirenal tissues.

3. Hematoma of the mesentery or retroperitoneal tissues frequently occur.

4. Gangrene of portions of the intestine as result of crushing or tearing from mesentery.

5. Suppurative peritonitis.

The Intestinal Wounds:

1. May be very small perforating wounds, "pea or millet size."

2. Larger wounds extending up to a complete separation of the lumen. The larger wounds are the more common.

3. The free border of the intestine more commonly suffers than the mesenteric border.

4. Frequently portions of mucosa are forced out of the wound far enough to come in contact with the peritoneum. This, together with muscular contraction, seems to be an attempt at closure.

Multiple Wounds (20 cases of 134).

1. Most frequently are found two near together, both rather small, or one a little larger than the other.

2. In 2 cases, 3 perforations were found.

3. In some cases the perforations lie at a distance from each other.

4. In one case one rupture occurred in a hernia, the other in the free abdominal cavity, but were only 7-8 cm. apart.

Symptoms.

I. General.

1. Shock, of greater or less degree. In a few cases has been so severe as to cause immediate death.

2. Pulse. Is often slow during shock period, due to vagus irritation. May be of normal rate. In 2 reported cases was rapid (108-128). After recovery from shock, may be practically normal until peritonitis begins.

3. Respiration — superficial and rapid. Abdominal breathing usually stops.

4. Temperature — relatively unimportant.

II. Local.

1. Free gas in abdomen. Most marked in stomach rupture.

2. Appearance of abdominal dullness, meaning hemorrhage or escape of intestinal contents.

3. Spontaneous pain, usually immediately after the injury, and almost always present.

4. Tenderness to pressure, diffuse or circumscribed. Usually present (of 136 cases absent in only 1).

5. Vomiting, especially when repeated and continuing over several hours.

6. Board-like contraction of abdominal wall. May be absent in severe shock.

7. Pain upon urination — occasionally.

8. Failure to pass feces or gas—frequent.

Diagnosis.

Exploratory laparotomy. Injection of air or water per anum and observation of abdominal changes subsequently is condemned.

Prognosis.

1. Of 106 cases operated, 29 recovered = 27.3%.

2. As to time of operation — it is noted that of the cases operated inside of 12 hours almost 50% were saved. In the second 12 hours only 20% were saved.

Treatment.

Operation as soon as possible.

1. Narcosis. Ether is better borne, as the cardiac force has already suffered from the peritonitis.

2. Treatment of intestinal wound.

a. Usually a two-row suture is found to be best. (In 61 cases 19 recovered. In no case did the stitches give way, so far as autopsies showed.)

b. When a very large rupture or transverse separation of gut occurs, resection must be done. (Of 17 cases 6 recovered.) In 8 cases the suture was employed, in 7 the Murphy button. In 2 cases a lateral anastomosis was made.

c. In 6 cases the ruptured portion was stitched into the abdominal wound. In 2 cases merely an abdominal tamponade was done. These cases were in very bad condition when operated.

3. When peritonitis and paralytic ileus are already present, an enterostomy is recommended.

4. Washing out with NaCe solution is recommended when the cavity is much soiled.— *Ueber stumpfe Verletzungen des Darmes und des Mesenteriums. Beiträge zur klinischen Chirurgie,* vol. 53.

W. C. DANFORTH.

TETANY PARATHYREOPRIVA. A Case Report with a Brief Discussion of the Disease and of the Parathyroid Glands. By Eugene H. Pool, M. D. New York.

The description of a case of post-operative tetany which occurred on the author's service at the French Hospital, New York, is supplemented by a study of the disease and of the parathyroid glandules.

The author reviews the history of the subject, in order to call attention to the long series of animal experiments and to the significant findings of Pineles and Erdheim in man, which have led to the belief among most observers that tetany following goiter operations is the direct result of the absence of parathyroid function.

Considerations Concerning the Parathyroid Glands. In the author's dissections, 2.9 glands per person were found. Although the position varies greatly, the glands are usually situated on or near the posterior borders of the thyroid lobes. The occurrence in pairs may porperly be considered the typical arrangement, a superior and inferior body being present on each side. The average size of the organ is about 6 by 4 by 2 mm.; the shape, variable; the color, brown-red or reddish yellow.

The organ consists of a mass of cells invested with a thin fibrous capsule. Three varieties of cells can be recognized:

1. "Principal cells," many of which seemingly consist only of nucleus and cell membrane, but some of which present an irregular, stained peripheral zone and a clear cytoplasm immediately around the nucleus. The variations in the relative width of the clear and the stained zones suggest that under certain conditions the cytoplasm

of the clear cells takes on a stain which acts first near the periphery and then progressively toward the nucleus until the whole cell body may be stained.

2. "Oxyphile cells," which have a relatively large, finely granular body.

3. Small granular cells which are not characteristic.

In some glands gradations may be traced from the clear "principal" cells through the granular cells of the same type to the small granular cells of type 3, and also from the latter to the large granular cells of type 2, when these occur singly or in small groups. Following the analogy of the salivary and other glands, the question naturally suggests itself as to whether the granular cells are not the functionating and the clear cells the resting condition.

The parathyroids or epithelial bodies are branchial cleft derivatives. They develop from the third and fourth branchial clefts of each side. On the basis of our present knowledge the relation of these bodies to the thyroid must be regarded as purely topographical.

The chief function of the parathyroid seems to be to prevent the action of certain toxic substances regularly present in the circulation.

Attempts to ascribe the etiology of all forms of tetany and even of certain allied diseases, as paralysis agitans, to an imperfect functional activity of the parathyroid glands, have not yet been successful.

Considerations Concerning Tetany. According to v. Frankl-Hochwart, whose descriptions of the disease the author follows, tetany parathyreopriva is characterized by certain very striking symptoms which render it practically unmistakable. The most conspicuous of these are intermittent tonic spasms of the voluntary muscles, those of the extremities being most affected. A salient feature is the exclusive involvement of the flexor group of muscles.

With the view of solving the therapeutic possibilities of parathyroid transplantations, animal experiments were made in an effort to determine the following points:

1. Can the parathyroid live if transplanted, first, between animals of different species; second, between animals of the same species?

2. If it lives, does it functionate; and, if so, is the function permanent?

In the author's experiments upon rabbits and dogs, tetany was obtained quite constantly by parathyroidectomy and thyro-parathyroidectomy. Moreover, the previous implantation of parathyroids into the spleen of these animals did not seem to affect the course of the disease.

In conclusion, Dr. Pool states that it has apparently been proved that the removal of all, and possibly even of a part, of the parathyroid bodies, results in tetany; that the symptoms of this disease are striking; that the diagnosis is usually simple; and, finally, that efforts directed towards cure have not as yet been proved to be successful. Considering the uncertain status of all therapeutic measures, the importance of prophylaxis is evident. The operator must attempt to leave at least two of these bodies in situ with blood supplies unimpaired. Considering the difficulty of locating the parathyroid at autopsy, it is evident that in an operation their recognition would prove a matter of chance. Therefore, in order to preserve sufficient of the parathyroid tissue, it is necessary to leave the posterior part of at least one lobe of the thyroid, in connection with which two of these bodies usually lie. Moreover, the thyroid vessels, especially the inferior on this side, should not be ligated. The practice of leaving the isthmus only is obviously a very dangerous procedure. In addition, if the other lobe is completely removed, the dissection should be carried as close as possible to the true capsule of the organ, and independent small bits of tissue should be sought for posteriorly, stripped from the thyroid and left uninjured. Moreover, in ligating the inferior thyroid artery on this side, care should be taken to avoid including in a ligature or clamp the inferior parathyroid which frequently lies in close relation to this vessel.—*Annals of Surgery*, October, 1907.

A Contribution to the Surgical Study of Tumors of the Head of the Pancreas. By Dr. Mauclaire, Prof. Agrégé á la Faculté de Médecine de Paris, Chirurgien de l'hôpital Dubois.

The partial pancreatectomy reported is one in a man of sixty-two years of age, who had suffered from epigastric pains associated with icterus for several months. The diagnosis lay between a neoplasm of the head of the pancreas or a calculus of the common duct. The laparotomy showed it to be a tumor of the head of the pancreas, of the size of a large plum. It was removed without serious hemorrhage. The histological diagnosis was that of epithelioma of the pancreas.

A small quantity of bile discharged through the wound for eight days. There was some discharge also through the cholocystostomy which had been made. The patient grew weaker and died at the end of two months.

Six cases of partial pancreatectomy for cancer have already been published. The operation is difficult on account of the intestinal and vascular

dangers, also a complete ablation of the tumor is impossible.

At the site of the head of the pancreas one finds epithelioma, sarcoma, cysts and, exceptionally, the chronicle pancreatitis and tuberculosis. The diagnosis of a tumor can be made by an examination of the feces, but the diagnosis of the nature of the tumor is possible only after surgical intervention. One often finds in this region pancreatic tumors which have developed on the relics of a Wolffian body.

Partial pancreatectomy of the head of the pancreas has already been performed four times for cancer, once for sarcoma, eighteen times for benign tumors, sixteen times for cysts, once for fibro-adenoma, once for tuberculous lymph-adenoma. Numerous cases of partial secondary pancreatectomy in the course of operation upon tumors in the neighborhood of the pylorus or colon are on record. The total ablation of the pancreatic head must be associated with partial or complete duodenal resection, and consequently associated operations are necessary, such as transplantation of the common duct and the duct of Wirsung into the duodenum or jejunum associated with gastro-jejunostomy; the palliative operations of cholecystostomy, cholecyst-gastrostomy or cholecyst-enterostomy give very little results. (Contribution à l' étude chirurgicale des tumeurs de la tête du pancréas.)—*Archives générales de Chirurgie*, July, 1907. Author's Abstract.

Are the Intestines Able to Propel Their Contents in an Antiperistaltic Direction? By Edwin Beer and Carl Eggers.

The above question has been answered both affirmatively and negatively. Only recently Wilms, in his exhaustive review of the literature of this subject, arrived at the negative conclusion. The experimental work of the writers and clinical observations point to an affirmative reply.

The experimental method has failed in the past, because the data that were collected proved inadequate and inconclusive. Our more extensive study, we trust, will harmonize many of the apparently widely divergent views and results found in the literature.

1. If segments of the small or large bowel be reversed and the continuity of the bowel be re-established, subsequent exposure and study of the behavior of the reversed segment will demonstrate whether this segment of the bowel is capable of acting in the reversed direction — i. e., capable of propelling its contents in an antiperistaltic direction. In four such experiments it was demonstrated at subsequent laparotomies that the direction of the peristaltic wave is reversed in the reversed loop, that it has become isoperistaltic with the bowel above and below the anastomoses. At first the waves run irregularly orad or rectad, but later the downward (antiperistaltic with reference to their original direction) waves predominate.

2. If extensive segments of the bowel are reversed and the animals have daily defecations, one must infer that the intestinal contents have been moved downward by antiperistalsis, as no other adequate force is conceivable. As another series of our experiments did not materially affect the regularity of the animals' defecations, they also point to the power of the bowel to propel its contents in an antiperistaltic direction.

3. Cannon and Murphy's recent observation of the behavior of experimental ileus cases (X-ray studies) in which the contents proceeded regularly as far as the obstruction and then moved backward (orad), also point to a similar antiperistaltic activity.

4. Last of all such well authenticated clinical observations, as the vomitory of stained enemata shortly after introduction into a normal intestinal canal, can be explained by active antiperistalsis alone.

Iodine and the Parathyroid. By W. L. Estes, Jr., and A. B. Cecil.

The possibility of an iodine containing compound being present in the parathyroid gland was first suggested by Gley who found in rabbit and dog parathyroids more iodine relatively than in their thyroids. Upon this he built his theory of a "Thyroid System of Organs," correlating the thyroid and parathyroid in function, believing that the parathyroids prepare the product of secretion which is then transferred to the thyroid, the reservoir that supplies the demands of the organism for iodine. Jeandelize later concurred in this opinion, adding further that Gley's hypothesis agrees with the physiological effects of extirpating the parathyroid. Chenu and Morel more recently have determined in chickens, dogs, and rabbits that the parathyroid contains one-fourth as much iodine as the thyroid, and believe the active principle of the parathyroid is not an iodine containing compound.

We have analyzed — using Baumann's method, that of our predecessor's — the parathyroids of dogs, cows, horses, sheep, and man; taking from 25–100 glands for each determination. Out of 17 analyses but 4 gave any indication of iodine and but one an appreciable and estimable amount; great care was taken to control the accuracy of our technique.

We conclude, therefore,

1. That iodine as a constituent of the parathyroid may, generally speaking, be neglected.

2. That, if present at all in the parathyroid, iodine occurs in such minute quantities as to be of no functional significance.

3. We fail to find chemical grounds for the Thyroid System of Organs, proposed by Gley.— *Bulletin of the Johns Hopkins Hospital*, September, 1907. Author's Abstract.

THE PARATHYROIDS OF THE HORSE. By W. L. Estes, Jr., and A. B. Cecil.

Sandstrom first described the parathyroid of the horse as situated at the superior pole of the thyroid; Moussu found it in the perithyroid tissue along the thyroid artery; Verdun believed it was separated from the thyroid only by its capsule; Jeandelize asserted the variability of its position and further believed there is another parathyroid in the horse hitherto undescribed, either within the thyroid or somewhere in the surrounding areolar tissue. Rogers and Ferguson more recently have found a parathyroid external to the thyroid, along its posterior border, which they distinguish with difficulty from neighboring thyroid and lymphatic glands, and a parathyroid within the thyroid near its middle.

We reviewed the anatomy of the parathyroids of the horse and found an external gland, easily detected, having a peculiar, typical, granular appearance, situated in general near the superior pole of the thyroid, but invariably associated with the thyroid artery. Its histology agreed closely with the human parathyroid; its connective-tissue strands somewhat thicker and the alveolar lumina obliterated. Fifteen per cent of these glands were found to be cystic; i. e., a large cyst enclosed in the capsule of the parathyroid. A parathyroid was also found within the thyroid, distinguished by its paleness of color and thus easily confused with adenomata which are of frequent occurrence. It is usually separated from the surrounding thyroid tissue by a thin strand of connective tissue, but occasionally shades off gradually into thyroid. Its position within the thyroid is most irregular, often just beneath the capsule or embedded at the superior or inferior pole.

The horse, therefore, has four parathyroids, two on each side; one external to, the other within the thyroid; and thus resembles the other herbivora in the distribution of its parathyroids.— *Bulletin of the Johns Hopkins Hospital.* Author's Abstract.

TESTICULAR TENDERNESS AND NEPHROLITHIASIS. By A. Bittorf.

It is a well-known fact that the pain occasioned by stone in the kidney not infrequently radiates down the groin into the testicle. It is not so generally known that the testicle of the affected side is exquisitely sensitive in an attack of renal colic due to stones. Bittorf reports several personal observations of his own and shows the importance of the symptom as an aid in differentiating kidney stone from conditions simulating it. In women, pressure on the ovary of the affected side discloses the same marked tenderness (due to irritation of the spermatic plexus) as does pressure on the testicle in the male. In painful kidney conditions other than stones, for example, tumor of the kidney or nephritis, tenderness of the testicle is not present. As the symptoms of colic disappear, the testicle or ovary gradually lose their irritability, but they remain sensitive just as long as there is the slightest trace of pain referable to the kidney itself.— *München, Med. Wchnschr.*, No. 23, 1907. M. G. SEELIG, M. D.

THE CAUSES OF THYMUS DEATH. By G. Hotz.

This report of Hotz is based upon a study of the literature, upon personal clinical experience, and upon a pathological-anatomical study. The conclusions reached by the author are:

An hypertrophied thymus gland interferes mechanically with the organs situated in the upper intrathoracic space, this interference being favored by the anatomic conditions present in the thorax of the small child.

Autopsy reports show that an enlarged thymus exerts pressure upon the trachea so as to cause symptoms of tracheal stenosis, and to leave behind distinct evidences of this stenosis. Less often there are signs of pressure having been exerted upon the heart and large vessels.

Direct pressure upon the large nerves has never been demonstrated. But in cases where autopsy has failed to reveal any cause for death, it has been assumed that death was due to pressure on the important nerves in the upper mediastinum, or to a reflex disturbance of the respiratory center in the medulla.

The operative therapy of removing the enlarged thymus has, so far, always been followed by favorable results. Removal of the gland, resection of a part of it, or ectopexy of the gland accomplish favorable results merely by doing away with the pressure that is causing a fatal dyspnea.— *Arch. f. klin. Chir.* b. lx, h. 2. M. G. SEELIG, M. D.

A SYMPOSIUM UPON SURGERY OF THE STOMACH

Prepared by Aimé Paul Heinlck

From the Archives Generales de Chirurgie, October 1907

The Surgery of Gastric Ulcer. By Charles Gauthier.

A. Gastro-Enterostomy for Gastric Ulcer

1. Its Advantages

It is a simple operation the steps of which are now well determined, the mortality of which is low. In 1905, Mayo Robson reported a mortality of 3.7 per cent in 186 cases. Jaboulay had 12 operations and no operative deaths. Whatever be the location, whatever be the clinical type of the ulcer, in the majority of cases good results immediately follow the performance of gastro-enterostomy. It rests the organs. It facilitates the evacuation of the stomach contents. Under these influences, the hyperacidity of the gastric juice diminishes. All these conditions contribute to cicatrization of the ulcer.

2. Its Disadvantages

A. *Persistence of recurrence of pain.* Some patients are only incompletely relieved; in others an improvement, followed by recurrence, occurs. In most of these cases we are dealing with ulcers adherent to the abdominal wall, to the liver, to the gall-bladder, or with ulcers that have perforated the tunics of the stomach and that are surrounded by peritoneal callosities. In one of these cases a secondary resection of the ulcer was performed in addition to the previous gastro-enterostomy and a permanent cure was obtained.

B. *Recurrence of the hemorrhages.* Warnecke, in 1903, reported 398 cases in which this accident occurred in 15 cases, with 5 deaths.

C. *Perforation.* A few cases are reported. They have occurred chiefly in ulcers too extensive for resection.

D. *Cancerous degeneration of the ulcer.* Mayo Robson says that in 60 per cent of cases of cancer of the stomach a history of ulcer is obtainable. In 37 cases of cancer of the stomach, operated by Jaboulay, such a history was noted 10 times.

B. Resection of the Ulcer

Resection of the ulcer, theoretically, is a radical cure of the lesion. It protects the patient from the complications which have been mentioned previously: recurrence of hemorrhage, persistence or recurrence of the pain, perforation, cancerous degeneration.

1. Inconveniences

The operative mortality is larger than that of gastro-enterostomy, still the method is new and the operative technique is susceptible of improvement.

2. Operative Difficulties

In large ulcers, especially if they be adherent to the neighboring organs, resection is out of the question. Nevertheless many surgeons fear so much malignant degeneration of the ulcer that they practice resection even if they have to attack neighboring organs, such as the liver, pancreas, etc. Adhesions of the abdominal wall to the colon do not contraindicate excision.

In some cases we are not able to find the ulcer, hence we are compelled in these cases to be satisfied with the performance of gastro-enterostomy.

3. Stenosing Ulcers

If it be a callous ulcer of the pylorus, remove it. If it be a simple ulcer, perform gastroenterostomy.

4. Ulcer with Perigastritis

If the adhesion of the abdominal wall to the colon or to the gall-bladder be not extensive, it is well to cut the adhesion and resect the underlying ulcer. If the ulcer be adherent to the pancreas or to the liver, the advisability of the excision is questionable. It is better to perform gastro-enterostomy in the majority of these cases. Gastro-enterostomy remains the operation of election for gastric ulcer complicated by extensive perigastric adhesions.

5. Multiple Ulcers

Resection may be attempted if there be 2, 3, or 4 ulcers, but usually in these cases the adhesions of the stomach contraindicate resection. If the ulcer be adherent to the abdominal wall and a gastric fistula exists, only resection is capable of curing the patient. If the ulcer has perforated into the peritoneal cavity, resection followed by suture is the operation to perform.

Gastro-enterostomy may be followed by diminution, by disappearance of inflammatory masses surrounding the ulcer. This is an unusual occurrence, and we must not depend upon it. We must keep in mind the possible immediate or late cancerization of gastric ulcer. We should, whenever the operation is feasible, perform resection instead of gastro-enterostomy. — *Chirurgie de*

l'ulcère de l'estomac. Archives Générales de Chirurgie, October, 1907.

THE SURGERY OF BI-LOCULAR (HOUR-GLASS) STOMACH. By A. Montprofit.

Hour-glass stomach is of different varieties. 184 cases, operatively treated, have already been reported. The functional disturbances to which it gives rise can easily be reasoned out. The same operative procedure is not applicable to all the different varieties.

Gastro-anastomosis and simple gastroplasty are the least serious operations performed for this malady. Recurrence, not infrequently, attends their performance. Their performance is indicated when the constriction occupies the central portion of the stomach. When the pylorus is normal and when there is not an ulcer complicating the condition (Mayo Robson), these two operations have a field.

Gastro-enterostomy is preferred by some surgeons (Von Eiselsberg, Guillemot, Montprofit).

The anastomosis must be made with the cardiac pouch, not with the pyloric pouch. It is always indicated if pyloric stenosis coexists. The gastro-jejunostomy may be anterior, ante-colic, may be posterior, retro-colic, may be the so-called Y gastro-enterostomy, may be associated with entero-anastomosis.

Gastro-duodenostomy was performed three times. Extirpation of the constricted portion also has its advocates. Its operative mortality is still high (12 per cent).

If the patient's condition is such that he cannot stand a long operation, as a provisional step resort can be had to jejunostomy. (Mayo Robson.)

Atypical and complicated operations are at times required owing to unusual malformations, such as tri-locular stomach, etc.—*Chirurgie de l'estomac bi-loculatre. Archives Générales de Chirurgie,* October, 1907.

SURGICAL INTERVENTION IN NON-PERFORATING ULCER OF THE STOMACH. By Charles Gaudemet.

Charles Gaudemet states the following conclusions as well-based:

1. Only such gastric ulcers as are not benefited by medical means demand surgical aid.

2. Operation is indicated:

a. In the presence of pain due to a spreading ulcer, to a perigastritis, to a stenosis, be the stenosis spasmodic or cicatricial in nature.

b. In hemorrhages. Frequently recurring hemorrhages call for operation.

c. In stenoses. Stenosis is an imperative indication for operation. Early operations are the ones that give the largest number of operative and therapeutic successes.

Choice of operation. Of the two operations, resection or gastro-enterostomy, the former has the highest immediate mortality.

Resection has the theoretical advantage of protecting from immediate dangers, such as hemorrhage, of protecting from late dangers, such as cancerous degeneration of the ulcer. It has the following shortcomings: It is not applicable to cases of multiple ulcers. One is liable to be satisfied with the excision of an ulcer and thereby to overlook the other ulcers. It removes the existing ulcer, but does not remove the cause of the ulcer; the patient thus remains exposed to the danger of recurrence. It is at times difficult of execution, and after suturing of the defect not uncommonly an odd-shaped stomach, unable to functionate normally, remains. It is permissible in certain ulcers of the anterior wall. It is not to be performed in most ulcers of the posterior wall, nor in those of the lesser curvature., If gastro-enterostomy has failed to mitigate or cure the symptoms, resection can be tried.

Pylorectomy, when not difficult of execution, may be performed in ulcers of the pyloric portion of the stomach. It must be performed, if malignant degeneration of the ulcer is feared. It must be completed by a gastro-enterostomy. The method to be employed is Billroth's second method. Perform an antero-gastro-enterostomy, then resect as much of the stomach and duodenum as may be necessary, closing each opening blindly.

Gastro-enterostomy is the operation of election. It can be performed with ease and with rapidity. Its comparative simplicity commends it. It is suited to all cases, because it affords rest to the stomach, and also because it always can be performed in healthy tissue. The author recommends that preference be given to posterior gastro-enterostomy and that the anastomotic opening be large and dependent. Select that operation which is least likely to be followed by a vicious circle.—*De l'intervention chirurgicale dans l'ulcère non perforé de l'estomac. Archives Générales de Chirurgie,* October, 1907.

TUBERCULOSIS OF THE PYLORUS AND TUBERCULOUS STENOSIS OF THE PYLORUS. By Ricard and Chevrier.

This is an uncommon affection. It is characterized by a somewhat elastic enduration located in the pyloric region. This enduration, unlike that of cancer, involves the duodenum for several centimeters. There is most always an extensive ulcer which tends to invade the entire circumference of the pylorus. The submucosa is much infiltrated. The edges of the ulcer are undermined. The tubercles develop in the margins and

in the base of the ulcer, hence the possibility of fistulæ.

In some cases, the tubercle bacilli have been detected. The regional lymphatic glands are often involved, they may be caseous, their enlargement may be considerable. The involvement of the retro-pyloric group may by compressing the pylorus cause symptoms of stenosis. It occurs with equal frequency in both sexes. Its maximum frequency is between the ages of twenty and thirty. The condition may be primary; it may be secondary to tuberculosis existing in another portion of the body. It is not always easy to determine how the causative germ has entered the organism, how it has reached the pyloric region. Tuberculosis and tuberculous stenosis of the pylorus may be secondary to a tuberculous ulceration of another part of the stomach. It may be of slow, it may be of rapid onset, and there may be remissions. The remissions may be due to an ulceration or to the formation of a pyloroduodenal fistula.

Tuberculosis may extend to other organs. As complications may be mentioned the accidents of ulcers, profuse hematemesis, perforation giving rise either to localized or generalized peritonitis. The prognosis is bad, owing to the rapid course, owing to the extension of tuberculous lesions to neighboring or to distant organs.

Owing to the fact that the peripyloric lesions are frequently extensive, owing to the fact that tuberculous disease of other viscera frequently co-exists, the resection of the tuberculous focus is dangerous and is not to be attempted. In most cases, palliative treatment is the one to be employed. This palliative treatment is not the section of the tuberculous bands, is not jejunostomy nor pyloroplasty. This latter operation is much in vogue in Italy. Gastro-enterostomy is the operation which we prefer. Operative results are not very satisfactory. In 7 cases only one cure was obtained.— *De la tuberculoses et les sténoses tuberculeuses du pylore. Archives Générales de Chirurgie*, October, 1907.

Cancer of the Antrum Pylori. By Leriche and Delore.

The antrum pylori is a prominence of the great curvature in the distended stomach, situated a short distance from the pylorus.

This is not an unusual seat for cancer. Carcinoma is more frequent in this location than the text-books would lead us to think. It is usually diagnosed only when it has involved the pyloric region and begins to be occlusive, that is, at the time it has obliterated partially the pylorus. Early gastrectomies for cancer of the stomach have revealed to us the frequencey of occurrence of cancer of the antrum pylori. In its early stages the first symptoms are dyspeptic, in its later stages the symptoms are those of stenosis. These tumors, owing to their juxta-pyloric site, are occlusive only at a late stage, only at the time that the tumor by progressive extension and invasion of the pylorus obliterates the latter. Hence, vomiting is a late symptom. These tumors in their early stage can easily be removed. Owing to the mobility of the antrum pylori, these tumors do not frequently contract adhesions. In them are found the best anatomical conditions for a large resection. In an individual not weakened by a long period of vomiting, in an individual whose general condition is not much impaired, the operative results are good. We report 8 cases. In 7 a pylorectomy was performed. There was only one operative death. Two of the patients are still alive; one four years and the other twenty-one months after the operation.—*Du cancer de l'antre pylorique. Archives Générales de Chirurgie*, October, 1907.

Gastro-cutaneous Fistulæ Secondary to Ulcers of the Stomach. By R. Leriche and Patel.— *Revue de Chirurgie*, 1906.

a. These fistulæ are relatively rare. They usually follow the spontaneous or the surgical opening of a perigastric suppurative focus. In other cases they are due to a stomach, the seat of ulcer, becoming so firmly adherent to the anterior abdominal wall, that the ulcer extends into the muscular planes and penetrates the whole thickness of the abdominal wall. When following surgical intervention, the abscess may or may not have been diagnosed previous to operation. The seat of election of these fistulæ is the upper portion of the stomach. This portion is not endowed with much mobility and can easily adhere to the abdominal wall.

b. Once established, the symptoms vary with the seat of the fistula. If it be high, that is, juxta-cardiac, the discharge is intermittent; if it be low, that is, juxta-pyloric, the discharge is constant. In the former, the general condition of the patient remains good; in the latter, decline easily sets in.

c. The treatment must consist of resection of the ulcer and of the affected portion of the abdominal wall, closure of the stomach by suture, and, finally, suture of the gap in the abdominal wall. This is a curative operation; gastro-enterostomy is only a palliative operation in these cases. A gap in the stomach which can not be closed by suture may be stopped by omentum or tamponed with gauze. *Les fistules gastro-cutanées consécutive à l'ulcère de l'estomac. Archives Générales de Chirurgie*, October, 1907.

INDICATIONS AND OPERATIVE RESULTS IN CANCER OF THE STOMACH. By Vincenent.

Diagnosis in these cases may be probable, may be positive. Usually the surgeon operates because of the presence of symptoms of pyloric stenosis. Symptoms of pyloric stenosis are ample justification for an exploratory operation. In these cases we begin with an exploratory laparotomy, and once having gained access to the abdominal cavity, we determine the nature of the operative treatment, which in some cases will be palliative, in others curative; gastro-enterostomy or gastrectomy. For instance, in 10 cases where the palpable tumor appeared mobile, in only 3 could extirpation be attempted, and in only 1 case did cure maintain itself without recurrence for over three years.

In cancerous stenosis of the pylorus gastro-enterostomy, though only a symptomatic treatment, gives a most favorable immediate prognosis; 11 cases out of 12 were successes. Its results are remarkable. The nutrition of the patient is improved, and appearances of perfect health can be restored for a period which may exceed a year. This improvement is noted even in those cases where the surgeon at the time of the operation has determined the presence of metastatic foci in the mesenteric glands. The removal of the tumor prolongs life, and gastrectomy, although it has a high operative mortality, remains in suitable cases the operation of election.

The histological variety of the tumor determines the frequency of recurrence. Some forms of cancer rapidly infiltrate all the tunics of the stomach walls, early involve the peritoneum and the neighboring organs. This type is not a favorable one for operation. The circumscribed tumors are those where the radical operation of resection finds its most successful indications. In some of these life can be much prolonged. The prolongation may be so marked as to lead one to consider the case as a true cure.— *Les indications et les résultats operatoires dans le cancer de l'estomac. Archives Générales de Chirurgie*, October, 1907.

GASTRECTOMY AND LATER RESULTS OF RESECTION IN CANCER OF THE STOMACH. By R. Leriche.

This article is based upon the study of 1366 reported cases. Mode of local and of lymphatic extension of cancer of the stomach. The technique of gastrectomy must be based upon our knowledge of the paths of extension. It is now established that in making a large resection we can often prevent recurrence. Cancer propagates itself chiefly through the submucosa, always the histological zone of infiltration in this layer is more advanced than elsewhere. It is an operative necessity to go beyond this zone, but by direct examination the limits of this zone can not be determined. As a general rule it ceases three or four centimeters beyond the point where the gastric tissue appears macroscopically healthy. It is there that you must cut. Each variety of cancer has peculiarities in its mode of local extension. Pyloric cancer is characterized by its tendency to spread along the lesser curvature. Even in small tumors the infiltration almost always goes as far as the cardia. The duodenum must always be looked upon with suspicion, because in 37 per cent of pyloric cancers it is histologically invaded.

Cancer extending chiefly by means of the lymphatic vessels, and this mode of extension being constant and early, the parastomatic lymph nodes are infected early. For each cancer the infection involves definite lymphatic gland groups. This involvement is irregular. For instance, in neighboring lymphatic glands of the same chain, contiguous to each other, some show neoplastic change, while others only show inflammatory change. It must not be assumed that every enlarged lymph-gland is carcinomatous. It is not surprising to find simple hyperplasia of some of the lymph-glands, as ulceration is of common occurrence in carcinoma. Naked eye examination does not enable us to determine the nature of the change. This lymphatic enlargement does not counterindicate an operation, but the entire chain must be extirpated.

Recurrence and later results. In the statistics at our disposal, two thirds of the patients that recover from the operation, resection of the tumor, ultimately die of cancer. Sixty-two per cent of these die of a local recurrence. In these cases, the resection has been made through the diseased tissues. Death due to metastatic cancers occurs in 25 per cent of these cases.

Billroth's Operation No. II. In our opinion it is the best operation to perform. This operation consists of resecting as much of the stomach and duodenum as may be necessary, closing each opening blindly. The operation is completed by performing an antecolic gastro-enterostomy. The authors have been able to collect 89 cases of cure lasting longer than three years, and 40 of these lasted longer than five years.

Operative mortality and complications. Mortality is still high, although it is declining. In 1239 cases the operative mortality was 25 per cent; nowadays the operative mortality is about 10 per cent and in favorable cases 5 per cent. The great cause of death is peritonitis, at times due to the operation, more commonly however to an insufficiency, to an incompetency of the sutures.

Many of the deaths are due to pulmonary complications, which nine times out of ten have their origin in the wound.

Among other causes of death may be mentioned shock, duodenal fistulæ, hemorrhage, etc. Most of these accidents can be avoided if the operation be very methodical and entirely aseptic.

Indications. All tumors of the stomach must be removed if they be extirpable and if the cachetic condition of the patient does not oppose the intervention. It must be removed not only on account of the accidents which it causes, but also because it is a cancer. It is so advantageous to perform early operations that as an absolute rule all individuals in whom cancer of the stomach is suspected and who are not benefited by a well-directed medical treatment, should be submitted to an exploratory laparotomy. The patients who do not vomit should be operated upon the same as those who do. They are frequently more operable because of the localization of the tumor (cancer of antrum pylori). To the ordinary exploratory laparotomy, followed by an exploration of the lesser peritoneal cavity, we add the mobilization of the duodenum. This renders the lesions more accessible. Once the resection has been decided upon, whatever be the type of operation, it must be performed with careful hemostasis.

Pylorogastric resection. Whatever may be the apparent limitation of the lesions, resection must include all the lesser curvature and the removal of the lymphatic nodes along this border. This resection must be extended as far as the cardia and must include at least three centimeters of the duodenum. The operation, very methodically performed, will include the following six steps:

1. Ligation of the coronary arteries and of the gastro-epiploical arteries. 2. Suture of the stomach and displacement of the tumor to the right. 3. Immediate closure of the cardiac stump. 4. Ligation of the gastro-duodenal and pyloric arteries. 5. Section of the duodenum and ablation of the tumor. 6. Re-establishment of the gastro-intestinal continuity.

For this type of operation Billroth's operation No. 2 is the operation of choice. It is anatomically, pathologically more logical, and technically easier to execute.

Total ablation of the stomach. Under this name must be included all those cases where the gastro-splenic region is to be removed. The author has collected 97 of these cases, with mortality of 39 per cent. The late results are very satisfactory. In sarcoma of the stomach wide resections are those less frequently attended by recurrence.—*Gastrectomies et résultats éloignés de la résection dans le cancer de l'estomac. Archives Générales de Chirurgie,* October, 1907.

A Contribution to the Study of Hemorrhagic Ulcer of the Stomach. By M. Leriche.

In the case of ulcer of the stomach, hemorrhage is the cause of death in 5 per cent of the cases; that is, in 20 cases of ulcer of the stomach one dies of hemorrhage.

In acute hemorrhages in ulcer of the stomach operation is not indicated. Medical treatment suffices in a great majority of cases. In chronic hemorrhages and in recurring acute hemorrhages gastro-enterostomy is the operation to perform, in all those cases where the ulcer is located in the pyloric region. The statistics do not yet tell us whether gastro-enterostomy is the treatment of choice in chronic ulcers which do not yield to medical treatment. This is one of the questions that the future must decide. Habershoun observed for ten consecutive years 60 patients who had ulcer of the stomach. Six of these patients died during acute spreading stage of the ulcer; that is, a few days or a few weeks after the onset of the accidents. Eighteen of the patients died in from one to twenty years after the onset of the ulcer. In almost all these cases, death was due to perforation or to hemorrhage. Thirty-six of these patients remained cured; that is, they remained ten years without symptoms referable to the gastric ulcer.—*Contribution a l'etude de l'ulcère hémorrhagique de l'estomac. Archives Générales de Chirurgie.* 1907.

Perforating Ulcers of the Lesser Curvature. By L. Pinatelle.

We have seen two perforating ulcers of the lesser curvature. Owing to the extent and the depth of the lesion, resection followed by direct suture was not feasible. The treatment adopted was isolation of the stomach from the rest of the abdominal cavity by gauze compresses. We have been able to collect 300 cases of operations for perforating ulcers of the stomach. Of these, 117 were found in this region. The majority of the ulcers occur in the region of the lesser curvature, but this is not the most frequent seat of perforation. Its high situation, its fixity, and especially the frequency of adhesion formation, often protect the general peritoneal cavity from affection and lead to the formation of perigastric abscesses. Clinically in these perforations we notice the persistency of vomiting. This is a symptom which usually is lacking in perforating ulcers of the greater curvature.

As soon as a perforation has occurred the patient must be laparotomized, and either direct suturing or, better still, an excision of the ulcer followed

by suturing must be performed. This operation, habitually, can be performed even if the ulcer involves the lesser curvature. Two conditions nevertheless may contraindicate it: peripheral adhesions, the friability of the margins and great size of the perforations. These adhesions, which we must always respect, at times render difficult and dangerous the seeking of the perforation; hence in certain cases we will abstain from this search and we will be satisfied with a protective walling-off. But if there be a free perforation with few or no adhesions, in some cases the extent and the friability of the margins of the perforation and the impossibility of performing a sufficiently large resection will prevent resection, and then we will have to use such methods as sutures à distance, suture of the ulcer to the skin, fixation of the omentum, which will frequently be combined with the walling-off.— *De la perforation des ulcères de la petite courbure. Archives Générales de Chirurgie*, October, 1907.

Gastropexy and Retention. By E. Nyrop.

Gastropexy is indicated in gastroptosis, accompanied with symptoms referable to ptosis or to an angulation of the pylorus. If the retention be marked, and be attended by functional disturbances, gastro-enterostomy is indicated. This retention may be determined by an angulation of the pylorus, by cicatricial pyloric stenosis, by compression of the pylorus, etc.

Rovising believes that the existence of adhesions of the serous coat of the stomach to the anterior abdominal wall does not occasion pain, but the author, Nyrop, reports cases which contradict this information.— *Gastropexie et Retention. Annales de chirurgie gastro-intestinale*, April, 1907.

Gastrostomy in Certain Forms of Peritonitis. By Gautier and Pinatelle.

Certain forms of acute peritonitis are accompanied by frequent vomiting. This vomiting has a tendency to evacuate the stomach, which is dilated by gas and grayish or greenish liquids, originating in the stomach and in the intestines. The stomach thus dilated can not completely evacuate itself. Satisfactory proof of this will be obtained by practising gastric lavage of the stomach after the patient has vomited several times. This lavage always brings back a fairly large quantity of fluid. Comparing gastric dilatation, which occurs in peritonitis, to retention of urine in the urinary bladder, the term vomiting by overflow has been coined.

Why is it that in certain forms of peritonitis we have dilatation of the stomach and repeated attacks of vomiting? Why is it that in other cases the stomach remains empty? May it not be that this gastric dilatation is due to a localization of the inflammatory processes, to the upper compartment of the abdomen? In fact, the latter is the explanation that has been given by some authors. The dilatation of the stomach in acute peritonitis is the cause of depression of the organism.

a. Visceral compressions. The gastric pouch, distended with gas and pathological liquids, pushes the diaphragm upward and compresses the heart. From this results dyspnea, cyanosis, and a tendendy to collapse. Below the stomach compresses the intestines and especially the transverse colon. Thus there follows a poor intestinal circulation which is already compromised by the paralytic ileus.

b. Dangers of vomiting. The pains and nausea incident to frequent vomiting exhaust the patient. They are potent factors in the production of shock They tend to diffuse the peritonitis. They prevent the taking of nourishment.

c. Intoxication. This greenish colored fluid contained in the stomach and which in part comes from the upper segments of the intestines is very toxic. The vomiting only evacuates one portion of it. A certain portion remains in the stomach to be absorbed and intoxicate the organism; hence it is indicated to empty the dilated stomach.

Lavage of the stomach has been done many times. It has given some successes, but it is depressing when it must be repeated, and in weakened, fragile patients its frequent repetition is exhausting. Evacuating gastrostomy with continuous drainage of the stomach contents is less collapsing than lavage. It is done once for all. With its completion disappear definitely dilatation of the stomach and all its inconveniences.

Its technique is very simple. After local anesthesia, a median incision is made and the juxtacardiac portion of the stomach is exposed. This portion of the stomach is fixed to the parietal peritoneum by a series of sutures approximating serosa to serosa. The stomach is incised in the center of the portion fixed to the abdominal wall, and a urethral catheter of large caliber is placed in the stomach. It is maintained in position by a suture passed through the skin. The contents of the stomach are evacuated by syphonage. The symptoms arising after gastrostomy are the following:

There is a continuous escape of gas and liquids, the quantity of which may reach three or four liters per day. In case of recovery the quantity of liquid drained diminishes. Its character changes, from being greenish at first it becomes yellowish, then, after the disappearance of bile, grayish.

It permits the immediate nourishment. Two or three hours after the evacuation of the stomach you can begin to inject milk, broth, and alimentary liquids through the catheter into the stomach. After the injection of nourishment, the catheter is then compressed for about 15 minutes. Some of the liquids injected return, some remain. The closure of the gastric fistula must be made when the temperature has fallen to normal, when the patient's general condition has improved, when the drained liquid has diminished in quantity and has lost its bilious character.

In one of the cases cured, closure was made on the sixth day; in the other on the tenth day. The method was applied five times. There were two cures and three deaths.— *De la gastrostomie dans certaines formes de péritonite. Archives Générales de Chirurgie*, October, 1907.

Perigastritis Secondary to Ulcer of the Stomach. By Cavaillon and Delay.

Pathological Anatomy. In many cases, the peritoneum in the neighborbood of the ulcer becomes inflamed and leads to the formation of adhesions, easily separated at first, but which in time are organized into dense fibrous tissue. Often in the center of these adhesions are small suppurative foci. All stages may exist from miliary abscesses to extensive suppurative perigastritis. These latter may be secondary to a perforated ulcer and be situated in the midst of dense adhesions, which take the place in part of the destroyed gastric wall.

But you may have a suppurative gastritis secondary to a non-perforating ulcer, secondary to an ulcer which has thinned the stomach wall sufficiently so the bacteria can reach the peritoneal coat of the stomach. Perigastritis protects the general peritoneal cavity from infection. Ulcers of the anterior wall do not often give rise to perigastritis; hence they expose the patient far more to peritonitis.

When the ulcer has perforated into a mass of adhesions, the hyperacid gastric juice may digest these tissues of new-formation, and the ulceration may extend to neighboring organs: liver, pancreas, or to the skin (cutaneo-gastric fistulæ); but we want to emphasize this, that perigastritis is dependent upon the ulcer. If the ulcer heals, the perigastritis does not progress.

Topography of Perigastritis. There may be the formation of isolated bands. These isolated bands may compress the intestines, may obstruct the pylorus, may determine pseudo-bilocular stomach. There may be posterior adhesions. These posterior adhesions tend to cause a disappearance of the lesser peritoneal cavity and to create intimate gastro-pancreatic adhesions. There may be subhepatic adhesions. These are most frequent and correspond to the ulcers of the lesser curvature. In marked cases the gall-bladder, the pylorus, and the hilus of the liver form one mass, and thus are determined disturbances in the excretion of bile. If the ulcer is in the neighborhood of the cardia, the left lobe of the liver may fuse with the stomach.

Anterior adhesions. Not common. The ulcers of this region are more frequently followed by generalized peritonitis. When adhesions exist, they are usually to the left and above the umbilicus.

In some cases, the stomach as a whole is surrounded by a mass of adhesions and is adherent to all the neighboring organs. Suppurative perigastritis may occupy any of these different localizations, but in the vast majority of cases a subphrenic abscess forms. This subphrenic abscess occupies inter-hepatic space of Martinet. The superior ulcers usually cause encysted suppurative foci in the lesser peritoneal cavity. Perigastritis has not a very typical symptomatology. It is overshadowed clinically, just as it is determined from the standpoint of etiology, by the gastric ulcer. Medical treatment is futile. The causal lesion must be attacked. The simple laparotomy, the liberation of the adhesions must be supplemented by ablation of the ulcer, which is the operation of choice, or by gastro-enterostomy. In many cases it is well to associate both of these operations. The suppurative foci must be drained.— *Les périgastrites consécutives aux ulcères de l'estomac. Exposé de titres à l'agregation. Archives Générales de Chirurgie*, October, 1907.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF OBSTETRICS

UNDER THE CHARGE OF

C. S. Bacon, M. D. — Rudolph W. Holmes, M. D.
C. v. Bachellé, M. D. — Hugo Ehrenfest, M. D.

Eclampsia and Parathyroid Insufficiency. Based upon a series of experiments concerning the influence of the parathyroid secretion, V. Frommer came to the following conclusions: that the parathyroid glands which are structures of an epithelial character and very vascular, have an antitoxic function, the lack of which permits the development of tetany. Partial parathyroidectomy causes no especial physiologic disturbance in rabbits, but total extirpation may cause death. Complete excision of the thyroid and parathyroid glands caused a fatal tetany to follow. In case of a partial insufficiency, the implantation of the placenta caused marked physiologic disturbance due to metabolic products of a toxic nature.— *Experimentelle Versuche zur parathyroidalen Insuffizienz in Bezug auf Eklampsie und Tetanie. Monatsschrift für Geb. und Gynäk.*, bd. xxiv, heft 6.

C. v. Bachellé.

Hebosteotomy. By Dr. Hammerschlag.

Hammerschlag reports a case in which hebosteotomy was performed and which was followed by evil results. The patient was 36 years old and had given birth to thirteen children previously. Her diagonal conjugate measured 11.3 cm. After seventeen hours of good pains, the fetal head still remained above the brim of the pelvis, the lower uterine segment became tender and the cervix edematous. Under these conditions he did a hebotomy according to Bumm's method, in which the needle is entered between the large and small labia and, under guidance of a finger in the vagina, is carried behind the pubic bone and brought out near the median line. The bone was cut easily and the fragments separated to the extent of 2 cm. This was accompanied by a considerable hemorrhage out of the lower opening, which could not be controlled by tampon, but was checked by a suture. The patient then was encircled by an elastic bandage and the labor allowed to progress normally. A catheter evacuated some pale bloody urine from the bladder. Four hours after the section the child weighing 4600 gms. was born. A retention catheter was placed in the bladder and drained off bloody urine freely. Later it ceased to drain properly, and the patient developed a very severe sepsis of which she died forty hours post partum. The autopsy showed the tissues of the space of Retzius infiltrated with bloody fluid, and in the region of the upper border of the bone incision was an opening 3 cm. long in the anterior wall of the bladder.

Undoubtedly the injury to the bladder allowed the escape of urine, probably infected with streptococci, into the space of Retzius whence arose the severe septicemia. The bladder injury, which so frequently occurs when hebotomy is done by Bumm's method, is usually followed by good results when the retention catheter is used, and this made him believe that even in this case the result would have been different had the patency of the catheter been maintained.

He believes, however, that the Döderlein method is the better one to use since it affords more certain protection to the bladder, although, in his opinion, it is slightly more complicated in technic.

He would also regard the existence of a bladder lesion as an indication for immediate delivery, since by waiting for spontaneous birth, even though a retention catheter is in the bladder, the descending head may so interfere with the flow of urine through the tube that it may escape through the lesion into the surrounding tissues.— *Warnung vor poliklinischer Ausführung der Hebosteotomie. Zentralblatt für Gynäkologie*, No. 33, 1907.

C. v. Bachellé.

Interstitial Tubal Pregnancy. By A. Rieck.

This interesting condition occurred in a woman 28 years old, who had previously borne two children. About one month after her last menstrual period, she had a severe hemorrhage lasting eleven days, and for which she was curetted. In seventeen days she had a recurrence of the hemorrhage

which ceased after rest in bed. Upon examination a tumor, the size of an apple, was found to the left of and adherent to the uterus. In order to determine whether it was a myoma or fetal remnants, the uterine cavity was sounded. The instrument entered in the proper direction to a depth of 8 cm., and then without resistance it slipped to the left and anteriorly to the depth of 17 cm., and the woman went into collapse. She was brought to Rieck's clinic showing all the signs of internal hemorrhage. The abdominal section showed a uterus fixed in the depth of the pelvis by a tumor the size of an apple, located on the left side, and at the left corner was a projecting mass as large as a walnut. The latter had a hole in it from which the blood flowed. This small tumor was excised and its base closed. The ovary and tube, together with the lateral mass which proved to be an hematocele, were removed and the left broad ligament used to cover the raw surfaces and the defect in the uterine wall. The patient made good recovery and is free of symptoms, although the uterus is fixed posteriorly and drawn to the left side.

The specimen of the tube was split lengthwise along the canal and showed its cavity running for ¾ cm. through uterine substance, then through the fetal sac to the opening which bled so freely at the time of the operation. The fetal sac was surrounded in ⅔ of its surface by uterine substance which gradually became thinner until on the top it was covered apparently by peritoneum alone.

Rieck believed that the first hemorrhage the woman had was a spontaneous one from a slight perforation of the thinned area on the surface of the interstitial pregnancy and gave rise to the hematocele which involved the adnexæ and broad ligament of that side. The last and almost fatal hemorrhage was, of course, caused by the use of the sound which perforated the fetal sac and apparently emerged through the same opening from which the first bleeding came.

He condemns the promiscuous use of the sound because of such dangers and states that one can learn the same facts by a careful bimanual palpation.— *Ein Fall von interstitieller Tubenschwangerschaft. Perforation durch die Uterus-und Tubensondierung. Zentralblatt für Gynäkologie*, No. 35, 1907. C. V. BACHELLE.

PREGNANCY FOLLOWING ATMOKAUSIS FOR STERILIZATION. By P. Meyer.

The report of this case is interesting, because atmokausis failed to produce sterilization, for which it was performed, and because atmokausis is proved to be a dangerous procedure where it is followed by pregnancy. Meyer's case is that of a woman thirty-six years old who had been pregnant twenty-two times. Only three pregnancies went to term, but the labors were spontaneous, the third being complicated by adherent placenta which required manual delivery. This was followed by a febrile condition for two months. Of the abortions only the last resulted in a febrile puerperium, after which curettage was performed. Epilepsy supervened after the last confinement. Sterilization by hot vapor was then attempted, but the patient continued to menstruate and became pregnant four months later. A sound was passed, but this failed to disturb the gestation, which continued accompanied with marked pelvic pain. At the fifth month severe hemorrhage occurred. Through a rigid cervix, dilated with difficulty, no part of the ovum could be palpated, but a short distance above the internal os a point of stenosis, resembling a spur, was found. Recesses on either side of this point gave the impression that the fundus of the uterus had been reached, so that a cornual gestation or a tumor of the posterior wall was thought of. Further examination, however, revealed a dilatation above this point of contracture in which the oval sac was found. This was ruptured, and after considerable difficulty a foot was brought down. Labor was thus induced, and the fetal head was delivered after perforation. The placenta was delivered manually, and it was now discovered that the gestation sac lay in a thinned-out chamber in the left portion of the uterine wall, while the right wall and the cavity took no part in accomodating the fetus. The author argues that, since the mucous membrane must have been insufficient to permit a normal imbedding of the ovum, it burrowed into the muscle, as it does in a tubal pregnancy, taking the place of an intramural fibroma and thinning out the left uterine wall.— *Ein Fall von Gravidität nach Sterilisation durch Atmokausis. Zentrbl. für Gynäk.*, No. 6, 1907. CARLY CULBERTSON.

BOOK REVIEWS

Metabolism and Practical Medicine. By Carl von Noorden, Professor of the First Medical Clinic, Vienna. Anglo-American Edition, under editorship of I. Walker Hall, Professor of Pathology, University, Bristol.

Vol. I. The Physiology of Metabolism. By Adolf Magnus-Levy. Berlin. Cloth. Pp. 450. Price, $4.00, net.

Vol. II. The Pathology of Metabolism. By Carl von Noorden, Fr. Kraus, Ad. Schmidt, W. Weintraud, M. Matthes, and H. Strauss. Cloth. Pp. 525. Price, $6.00, net. Chicago: W. T. Keener & Co. 1907.

The Anglo-American edition of Professor von Noorden's eminently practical text-book on the physiology and pathology of metabolism, the first two volumes of which are before us, will be cordially welcomed. The interest displayed in the problems of nutrition by the general profession during recent years constitutes one of the most encouraging indications of the modern trend of medical thought, and its influence on present-day clinical practice and therapy is already apparent. An attempt to fill the need for practical works on the problems of nutrition has been made by American authors, the recent volume of Professor Lusk entitled "The Science of Nutrition" being a contribution toward that end. The volumes of Professor von Noorden's treatise contain the most complete and authoritative review of this broad field, and constitute a work which appeals directly to the practicing physician by reason of its extremely practical character. The eminence of its authors in the scientific world furnishes a guarantee of the high standard of the work.

Professor I. Walker Hall, the English editor, has contributed to the high traditions of the original work by the discriminating manner in which he has fulfilled his task. He has added such new matter as was necessary to bring it up to date. This work is no mere compilation of facts and theories. The subjects discussed are divided and subdivided in such a manner as to facilitate reference and avoid confusion. Much of the detail which so often cumbers the pages of works of this character, thus detracting from their value to the physician, is judiciously omitted. Facts and theories are passed in review without too much elaboration, and are subjected to critical discussion.

Volume I, under the authorship of Professor Adolf Magnus-Levy, of Berlin, is devoted to the physiology of metabolism. Theories are given little mention unless they have some basis in the demonstrated figures of research, the subject of normal metabolism being discussed purely on the basis of results obtained by experimentation and observation. The author adds greatly to the practical interest of his discussion by reviewing the effects of various disturbances (inanition, plethora, fatigue, constipation, climate, etc.), and the effects of various drugs on the assimilative functions. Indeed, the author's treatment of the subject of normal metabolism is characterized throughout by strong practical bias, and he reverts again and again to the pathologic in contrast to the physiologic, thus preparing the student for a better comprehension of what is to follow in subsequent volumes on the morbid perversions of metabolism.

Volume II, which deals with the pathology of metabolism, is the combined work of von Noorden, Fr. Kraus, Ad. Schmidt, Weintraud, Matthes, and Strauss. To undertake a critical examination of this volume in detail would be impossible in this place, and unnecessary. It will suffice to say that therein will be found the most satisfying and practical discussion of the subjects dealt with, at present available. The headings of the various chapters show the field covered:

Hunger and Chronic Starvation.

Over-Feeding.

Metabolism in Fever and Infection.

Metabolism in Diseases of the Stomach and Intestines.

Metabolism in Diseases of the Liver.

Metabolism in Diseases of Respiration and Circulation.

Metabolism in Diseases of Blood.

Metabolism in Diseases of Kidney.

An excellent bibliography accompanies each section in the text, and it is a pleasure to note recurring references to the work of American investigators — a consideration not often shown in German text-books.

The books are printed on unusually good paper, and are light and easily held for reading. Medical books have become so bulky and heavy as to make it a matter of actual physical work to read them without the help of a book-rest. Although these

volumes are large, they are light in weight and easily handled.

W. T. Keener & Co. are the American publishers, and they deserve the thanks of the profession for furnishing us with a home edition of so valuable a work. ARTHUR R. ELLIOTT.

THE PRINCIPLES AND PRACTICE OF MODERN SURGERY. By Roswell Park, A.M., M.D., LL.D. (Yale), Professor of the Principles and Practice of Surgery in the Medical Department of the University of Buffalo, etc. With 722 engravings and 60 full page plates in colors and monochrome. Philadelphia: Lea Bros. & Co. 1907.

This later addition to the ranks of text-books of surgery amply justifies its existence. It is intended to replace the "Treatise of Surgery by American Authors," edited by Prof. Park, and the happy issue attained by the talented author makes it a worthy successor of that well-known text-book.

While it is obviously impossible to present much that is new in a work of this character, nevertheless a certain amount of originality of arrangement and expression of the well-known facts can be exhibited. This has been most ably demonstrated by the author. His ability of simplifying intricate subjects without sacrificing any of the essential facts is evident throughout the various chapters; while his unquestioned standing as a surgeon of the highest ability rob the terse and positive statements of all spirit of dogmatism. It seems that no attempt has been made to discuss elaborate theories and to load the student with the burden of an endless array of possibilities in discussing the various phases of surgical diseases. Rather, the author has contended himself with stating as truths those accepted things which are true in the great majority of instances. This brings the student to a full understanding of the essential, allows him to get a clear and well-defined mental image of the condition described, and does not lead him adrift on a sea of probabilities and possibilities where he cannot find his bearings.

That the work is thoroughly modern and up-to-date is shown by the discussion of some of the newer discoveries of modern surgery. Such subjects as the opsonins, the status lymphaticus and the nature of the virus of syphilis may be mentioned as examples in this connection. The chapter on gunshot wounds, considering the effects of modern high velocity projectiles, takes into account the results noted in the Russo-Japanese war; it is intensely interesting.

The chapters on pathology are of unusual value, and it would seem that the author has succeeded in presenting this part of the subject in a way that must make it easily assimilated by the student and general practitioner. The chapter on malignant tumors and the discussion of their etiology brings up the question of their ultimate cause. The author inclines toward the parasitic origin of these growths.

It is a pleasure to note that some of the less important divisions of the surgical science have been successfully condensed. Amputations, resections, ligation of arteries, and fractures, dislocations, at one time formed the greater part of the surgeon's domain, while they occupy only a small part of the modern surgeon's attention. While some of the text-book writers still give them the prolix descriptions of the older authors, the author of Park's surgery has relegated them to their proper position and considered them briefly, but not the less succinctly. Gynecological surgery has been entirely omitted, and with propriety, as this subject is usually handled *in extenso* in American medical colleges.

The illustrations are of particular value. To quote from the author's preface, he "has been free to employ illustrations, whenever a point could be so explained to the eye. Utility and effectiveness have been considered of more importance than extreme and unusual cases."

After a careful perusal of this book, it can truthfully be said that the author has been most successful in carrying out his plan, that the work should represent "the *net* surgery of to-day, obsolete and obsolescent material having been excluded, and the pages being devoted to sound principle and practice, stated as clearly and succinctly as possible."

The publishers are to be congratulated on the excellent appearance which the book presents. There can be no doubt that Park's "Modern Surgery" will be immediately adopted by many surgeons as the standard text-book, to be recommended to their students, and that it will replace the bulk of those at present in vogue. It will also make many friends among the ranks of the general practitioner, who will find it an excellent means of again coming abreast of the latest of advances of surgery, without himself being put to the necessity of separating the wheat from the chaff.

ALBERT E. HALSTEAD.

DISEASES OF THE INTESTINES AND PERITONEUM. By Prof. Dr. Hermann Nothnagel, late professor of special pathology and therapy, University of Vienna. Edited with additions by H. D. Rolleston, M.A., M.D., F.R.C.P., Physician to St. George's Hospital, and the Victoria Hospital for Children, London. Second edition thor-

oughly revised. Authorized translation from the German under the editorial supervision of Alfred Stengel, M.D., Professor of Clinical Medicine in the University of Pennsylvania. Philadelphia and London: W. B. Saunders Company. 1907.

Since the first edition of this work was published in 1904, its eminent author has passed away. This volume on the Intestines and Peritoneum, and the admirable system known as Nothnagel's practice, of which it forms a part, constitute a wonderful token of the scientific activity and accomplishment of this world-famous authority. It is a remarkable indication of the eager reception accorded this encyclopedic volume in this country, that a second American edition is called for in the short space of three years. The editor, Dr. Rolleston, was highly commended at the time of its original publication for the judgment and thoroughness with which he had performed his task. In the second edition he has found it necessary to make a considerable number of additions, in order to bring the volume up to date, and also to rearrange and modify somewhat his editorial contributions to the edition of 1904. The result of his labors is a volume which in every way thoroughly covers the subjects treated. Over one hundred pages of text are devoted to the ever-important subject of appendicitis. Sine 1904, special works on the appendix have been published by Kelly and Hurdon, and by C. B. Lockwood. Numerous citations from these works are incorporated in the editor's additions. In discussing the question of when we shall operate for appendicitis, the author deprecates "the rule," except when the assumption is well founded that we are dealing with the gangrenous or phlegmonous type of inflammation, preferring under other circumstances to consider each case on its own merits, treating the cases medically at first, and operating later, if necessary. On other subjects of medical-surgical nature his stand is equally free from radicalism, on the one hand, or ultra-conservatism, on the other. The volume will be found to constitute "the last word" on diseases of the intestines and peritoneum.

A. R. E.

The Operating Room and the Patient. By Russell S. Fowler, M. D. Philadelphia and London: W. B. Saunders Company. 1907.

This volume which consists of about 270 pages of text contains much useful information. The illustrations are especially instructive. The mechanical work is excellent, the type large and clear, and the book is fully indexed. There is much to commend in the book. A few criticisms are permissible. Some typographical errors are present. For instance, on page 192, the word decubitus is spelled *decubitis*. The author does not at all make use of the metric system in his work. In our opinion, increased familiarity with the metric system can but be of use in the dispensing of pharmaceutical preparations. This is a sin of omission, hard to understand in view of the simplicity of the metric system and of its general adaptation in the scientific world. An interesting, but not very complete chapter on anesthesia is included. The drop-method of ether anesthesia is employed. The technique and the limitations of spinal anesthesia are well stated. The different operative positions, as, for instance, the reversed Trendelenburg operation, are well illustrated. Illustrations, when well executed, quickly and accurately convey to the reader the author's conceptions. A very practical chapter, and the preparation of which, in our opinion, must have demanded painstaking care, is the closing chapter of the work. It gives in tabulated form a complete list of the dressings, instruments, etc., needed in operations upon the different portions of the body.

Aimi Paul Heineck

The Practice of Obstetrics. By American authors. Edited by Charles Jewett, M. D., Professor of Obstetrics in the Long Island College Hospital, Brooklyn, N. Y. In one octavo volume of 820 pages, illustrated with 484 engravings, 46 of which are in colors, and 36 colored plates. Third edition, revised and enlarged. New York and Philadelphia: Lea Brothers & Co. 1907.

Jewett's Practice of Obstetrics has for some years held rank as one of the most serviceable, both for the student and practitioner. The various authors' contributions have been planned and edited in such a way as to give homogeneity and completeness to what would otherwise be patently a composite work. Hence the book is a compilation that sounds the note of authority. The matter is presented simply, concisely, and after a plan well adapted to the teacher's and student's use.

Among the changes from the previous editions are the chapters contributed by W. S. Stone on Changes in the Maternal Organism Caused by Pregnancy, the Duration of Pregnancy, the Hygiene and Management of Pregnancy, the Anomalies and Diseases of the Fetal Appendages and the Diseases of Pregnancy. The chapter of Ectopic Gestation stands practically as rewritten for the second edition, but, as presented at this time, may be regarded as a posthumous work of its author, Fernand Henrotin. E. H. Bartley is the present contributor of the chapter on Malformations, Injuries, and Diseases of the New-born Child. Other

portions of the work show considerable revision, notably the chapters contributed by Dr. Jewett himself.

CAREY CULBERTSON.

GYNECOLOGY AND ABDOMINAL SURGERY. Edited by Howard A. Kelly, M. D., F. R. C. S. (Hon., Edin.), and Charles P. Noble, M. D. Illustrated by Hermann Becker, Max Brödel, and others. Volume I. Philadelphia and London: W. B. Saunders Company. 1907.

Volume I of Kelly and Noble's pretentious work on Gynecology and Abdominal Surgery is a magnificent book, handsomely printed, illustrated and edited. This first volume treats of the following subjects as indicated by the chapter heads: Gynecologic Technic; Bacteriology; Pathology of the Reproductive Organs; Medical Gynecology; Non-plastic Operations of the Vulva and Vagina; Plastic Operations on the Perineum, Vagina, and Cervix, Curettage of the Uterus, and Inversion of the Uterus; Combined Gynecologic Operations; Diseases of the Bladder and Urethra; Vesical Fistulæ; The Preparatory Treatment of Celiotomy Cases; After-Treatment of Celiotomy Cases; The Celiotomy Incision; Operations for Retrodisplacement and Prolapse of the Uterus; Ovariotomy; Vaginal Section for Diseased Ovaries and Tubes; Removal of the Uterine Appendages; Abdominal Hysterectomy for Inflammation of the Uterine Appendages; Vaginal Drainage for Pelvic Abscesses; Abdominal Hysteromyomectomy and Myomectomy; Vaginal Myomectomy; Radical Abdominal Hysterectomy for Cancer of the Uterus; The Byrne Method of Treatment of Carcinoma of the Uterus; Vaginal Hysterectomy; Conservative Operations on the Ovaries and Tubes; and Operations Before Puberty.

The scope of the work, the incentive of the authors and the methods employed in accomplishing its execution can best be gained by the authors' own words:

"In the preparation of this work the editors have been continually impressed with the intimate relationship which exists between gynecology and abdominal surgery. Our associates, competitors, and generous critics, the general surgeons, will not deny that the great advances made in the gynecologic field have constituted the very backbone and the marrow of the abdominal surgery of to-day, and that pari passu with the labors of the gynecologists have gone the developments of the surgery of the abdomen at large. The volumes embracing both subjects are living witnesses of the unity of gynecology and abdominal surgery in the practical field, which it is our pleasure to proclaim, as we thus once more assert the unity of our art and the fraternity of those who practice it.

"In planning our work the usual classification of the handbooks has been set aside, in order to substitute one of greater practical value to the general practitioner, to the investigator, and to the surgeon.

"A considerable section is devoted to medical gynecology, to meet the needs of the general practitioner who will find the information he requires concentrated in one section, without being under the necessity of searching here and there throughout both volumes.

"Certain obstetric or gynecologic-obstetric subjects have been included in our list, such as the puerperal injuries and infections, the treatment of incomplete abortion, ectopic pregnancy, and the Cæsarean operations. It is believed that this will prove not only of practical value to the physician, but will give the general surgeon practicing abdominal surgery without an obstetric training a broader and fuller view of the subject.

"Separate chapters have been devoted to the systematic consideration of the bacteriology and the pathology of the diseases of women. Those wishing to investigate the scientific basis of gynecology will find it suitably set forth in these sections. We believe that no other monograph on pathology as complete as this has as yet appeared in the English language.

"Other special chapters have also been written upon subjects usually found only in monographs; such as operations during pregnancy, operations before puberty, conservative operations upon the uterine appendages, and the complications of operations.

"Surgical gynecology and abdominal surgery proper have been broadly and liberally dealt with. We have naturally devoted our especial attention to modern surgical technic, and have been at pains to provide that the operations themselves should be profusely illustrated with fresh, accurate, and graphic drawings.

"To prevent undue expansion of our work, space has been spared by omitting elementary matters found in every text-book.

"The historical development of gynecology and abdominal surgery has been carefully treated, showing the prominent part played by American surgeons in these fields.

"Concerning the relative advantages of the abdominal and the vaginal route for the performance of various operations there are still decided differences of opinion. Here we have presented the claims of the two schools from the affirmative standpoint, by selecting tried advocates to present each side.

"The illustrations have been done by, or under the supervision of Mr. Hermann Becker, who has devoted more than four years to his work; almost all the drawings are from his hand; some have been made by Mr. Max Brödel, and others.

"Three of our collaborators, Drs. Alexander J. C. Skene, Wm. R. Pryor, and Fernand Henrotin, have died during the preparation of this work. We take pleasure in presenting to the profession their last contributions to gynecology.

"This work is the first in which the attempt has been made to cover both the fields of gynecology and of abdominal surgery. Its subject-matter has been further broadened by the consideration of medical gynecology, of various practical subjects usually dealt with only in monographs, and also the gyneco-obstetric field. We hope that this will make our work unique in its presentation and in its claims upon the consideration of the profession."

The authors selected to write these volumes are: Brooke M. Anspach, M. D; J. M. Baldy, M. D.; J. C. Bloodgood, M. D.; Henry T. Byford, M. D.; John T. Clark, M. D.; George M. Edebohls, M. D.; John M. T. Finney, M. D.; William W. Ford, M. D.; Anna M. Fullerton, M. D.; Fernand Henrotin, M. D.; Barton Cooke Hirst, M. D.; Guy L. Hunner, M. D.; Elizabeth Hurdon, M. D.; George Ben Johnston, M. D.; Howard A. Kelly, M. D.; Beverly MacMonagle, M. D.; Edward Martin, M. D.; Floyd W. McRae, M. D.; G. Brown Miller, M. D.; B. G. A. Moynihan, M. S.; John B. Murphy, M. D.; Charles P. Noble, M. D.; Richard C. Norris. M. D.; J. A. Ochsner, M. D.; Eugene L. Opie, M. D.; James F. W. Ross, M. D.; Alexander J. C. Skene, M. D. J. C. Webster, M. D.; X. O. Werder, M. D.; and J. Whitridge Williams, M. D.

A critical analysis of this work will be furnished to our readers when the second volume is published and placed in our hands. In the meantime, the reviewer can assure the reader that the work, judging from the first volume, will rank as one of the classics of gynecology and surgery.

Elements d'Obstetrique. By V. Wallack. Paris: G. Steinheil, Editeur.

Professor Wallack presents a work which, as far as it goes, is ideal. It is written in a plain, unvarnished way, devoid of any ambiguous statements, and in this respect is a book worthy of emulation by many text-book writers of to-day. Every subject is presented in a systematic way, complete in every detail as to text. The subject of forceps, for instance, is made clear to the student and leaves nothing wanting. The indications and conditions for the use of the forceps, the technic in their use and the kind of forceps to use leaves nothing to be doubted.

The book is printed upon thin paper with a flexible cover, contains 650 pages, is about one third the size of the usual text-book as to volume, which is certainly an advantage. To be regretted is the limited number of illustrations, poorly printed and placed in the back of the book instead of with the text. The omission of the anatomy and physiology of pregnancy renders the book an incomplete one, and it is to be hoped in future editions that the author will see the advisability of adding this department to his excellent work.

Chas. E. Paddock.

American Practice of Surgery. By Bryant and Buck. Volume II. New York: William Wood & Co.

The second volume of the Bryant and Buck System presents many of the admirable features of the first volume, and we can safely assume that the standard established will be maintained throughout.

The first chapter, on leprosy, is very complete, covering twenty-seven pages, including four full-page, well executed, colored plates of various types of the disease. The entire discussion of the subject leaves little to be desired.

Chapter II discusses plague in a careful and painstaking manner. It occupies thirteen pages with many valuable cuts.

Glanders and anthrax are next considered and are treated of in an adequate manner comparable with their relative clinical importance.

Actinomycosis is a disease of rather frequent occurrence, and it would seem to us that a discussion of this subject, which covers only four or five pages, is hardly sufficient for a system which promises to be as complete as this one.

The remaining portion of Part VI is devoted to the consideration of mycetoma, rhino-pharyngitis mutilans, and scurvy.

Part VII is devoted to the subjects of tuberculosis and syphilis from a surgical standpoint.

The treatment of the subject of tuberculosis is very complete, and quite adequate for the general discussion of a disease which must of course be considered again and again in relation to special organs.

The discussion of the subject of syphilis is remarkably clear-cut and complete. It is one of the most carefully written and scientific chapters of the volume.

Part VIII occupies about three hundred and eight pages of the volume, and the subject of suppurative inflammations and surgical diseases of

some of the special tissues are considered under these headings: Abscess, Ulcers and Ulcerations, Gangrene and Gangrenous Diseases, Surgery of Diseases of the Skin, Surgical Diseases and Wounds of Muscles, Tendons, Bursæ, Connective Tissue, Nerves and Lymph Nodes and Vessels.

This section is well illustrated with many cuts and colored plates which aid in the elucidation of the subject and add materially to its completeness.

We cannot agree with all the authors' opinions in their discussion of the pathology and the treatment of suppurative processes, but in the main the text is scientific and well written. The chapter on surgical diseases of the skin is well illustrated and complete in text, but its scientific value is lessened by the authors' statements in the introductory remarks relative to the treatment of epithelioma.

Part IX. This section considers the subjects of burns and the effects of electric currents and lightning. Frost-bite is also discussed.

The last part deals with the wounds of soft parts, including gunshot wounds.

It can be said of this chapter that it is scientific, complete and will unquestionably prove to be of great value to military surgeons as well as civil surgeons who have to deal with gunshot injuries.

The general make-up of this volume from a printer's viewpoint is excellent. The paper, illustrations, type, and binding are examples of the best in the printer's art.

Obstetrics. By J. Whitridge Williams. Second edition, Appleton's.

In passing into its second edition, this splendid text-book has received numerous additions to its illustrations and letterpress.

The chapters on the development of the ovum and upon the Toxemias of pregnancy have been carefully revised and brought up to date, while much new material has been added in the chapters on metabolism of normal pregnancy, vaginal Cæsarean section, pubiotomy and contractions of the pelvic outlet. In its fine coherency and constant harmony this book excellently illustrates the superiority of a work developed out of the investigations and experience of one man over books made up of many contributions by writers of no matter how great eminence, for however careful the supervision may be, it is never possible to eliminate entirely the duplications and contradictions, nor to conceal the joints at the points of contact.

The signs of pregnancy are concisely and adequately classified, the chapters on hemorrhage, eclampsia, and pelvic contractions are covered most satisfactorily, while none of the minor points, which are so important in a text-book, are anywhere lacking.

Due mention is made of every necessary item in the art of obstetrics and treated in accordance with its relative value and importance, so that perfect balance is obtained throughout the book.

Credit is given everywhere where credit is due, in the broad, liberal and scholarly spirit, and the bibliographical annex to each chapter, unusual in an American text-book, is a constant source of interest and delight. The illustrations are apt and abundant, and the letterpress all that could be desired.

Williams' work is very difficult to review, since one is constantly tempted to run into what might seem to be extravagancies, and yet, when one begins to mention the various excellencies it is impossible to stop.

When the first edition of the book appeared the writer of this review sat up half the night, as one would with a fascinating novel, in an enthusiastic and jubilant perusal of the work. The exquisite literary style which is so rarely seen in combination with the scientific method, contributes an unusual charm to the enjoyment of the reader. Without being fulsome in praise, and yet with the feeling that the reviewer is not doing full justice, one can only say that Williams' Obstetrics unites in one harmonious and delightful volume all the attributes which go to make a perfect text-book for student or practitioner. C. B. Reed.

BOOKS RECEIVED

Die Entwicklung und Form des Fötalen Beckens. Von Dr. Edmund Falk, Frauenarzt in Berlin. Mit 6 Abbildungen im Text und 5 Tafeln. Berlin 1908. Verlag von S. Karger.

A Text-book of Practical Gynecology. By D. Todd Gilliam, M. D. Second Revised Edition. Extra cloth, $4.50 net; half morocco, gilt top, $6.00 net. Sold only by subscription. Philadelphia: F. A. Davis Company. 1907.

The Pancreas. Its Surgery and Pathology. By A. W. Mayo Robson, D.Sc. (Leeds), F.R.C.S. (Eng.), of London, and P. J. Cammidge, M.D. (Eng.), D.P.H. (Camb.), of London. Philadelphia and London: W. B. Saunders Company. 1907. Cloth, $5.00 net; half morocco, $6.50 net.

Diseases of the Skin. By Henry W. Stelwagon, M.D., Philadelphia. Fifth edition revised. Philadelphia and London: W. B. Saunders Company. 1907. Cloth, $6.00 net; half morocco, $7.50 net.

NICHOLAS SENN, PH. D., M. D., LL. D.

THE announcement of the death of Dr. Nicholas Senn has filled the hearts of the medical profession of the world with grief, and brought sorrow to all classes of the commonwealth in which he lived. The editorial staff of SURGERY, GYNECOLOGY AND OBSTETRICS mourn the loss of their senior colleague, their esteemed and beloved councilor and companion.

The citizen Senn was of Chicago and America; he has passed from our midst. The Surgeon Senn was of the world; he lives, and will continue to live for all time, in the art and science of surgery, which he adorned and enriched. A review of his life, struggles, and achievements forces the conviction that surgeons are born, and not made; that opportunities are forced, and not found; that genius and real talent find the place and the way.

Nicholas Senn was born in the Canton St. Gaul, Switzerland, October 31, 1844. He came with his parents to America, 1852, and settled in Ashford, Wisconsin, then a frontier town. He graduated from the Fond du Lac high school, 1864, after which he taught country school for two terms. During this period he made a close study and botanical analysis of the flora of that district. He loved nature and was always happy when close to it. He was endowed by inheritance with an excellent physique. He had a splendid memory and a clear, forceful mind, all of which sustained him in his indefatigable labors.

In 1865 he began the study of medicine at the Chicago Medical College, and graduated from that institution in 1868. In the competitive examination at the close of his college course, he won the position of resident in Cook County Hospital, sharing the honor with his classmate and lifelong friend, Professor William E. Quine.

He began the practice of medicine in the hamlet of Elmore, Wisconsin. Five years later he moved to Milwaukee and became a member of the hospital staff. 1877 and 1878 he spent in the University of Munich, Germany, from which he graduated in the latter year. He returned to Milwaukee and continued the practice of medicine until 1893. During that time he carried on continually animal experimentation in various lines. While practicing in Milwaukee, he was called to the chair of surgery in the College of Physicians and Surgeons in Chicago. Two days a week he came eighty-eight miles to deliver his lectures and conduct his clinics. His superiority as a teacher was immediately appreciated. So clear and forceful were his clinical presentations, and so thorough his knowledge of pathology and surgical principles, that his lectures were not only attended by the full student body, but were patronized by a large number of practicing physicians and surgeons, not infrequently including that master surgeon, Christian Fenger.

In 1888 he became professor of surgery and surgical pathology in Rush Medical College. In 1891 he succeeded the late Charles Theodore Parks in the chair of practice of surgery and clinical surgery in Rush Medical College, the most important surgical appointment west of the Alleghenies.

We naturally ask, Why these rapid promotions? Dr. Senn realized in early life that all that was necessary to success was to lay hold of that which was within easy reach and appropriate it to the service of his art and science; in other words, to do things now and with the present.

While yet a country practitioner in Wisconsin, he applied himself to the real task of learning Nature's laws by experimenting with Nature's materials, for the purpose of establishing definite principles of repair. His industry, zeal and perseverance were recognized qualities. He had the self-imposed task of self-education, and was responsible to an uncompromising master.

He was one of the first on the Western Continent to conduct systematic and original animal experimentation; this work proved a great factor in his evolution as a surgeon, pathologist and teacher. Of these early days, an old practitioner relates: "Young Senn always came to the State Medical Society meetings with a large manuscript, not full of words and theoretical dreams, but replete with careful experimental observations and supported by specimens from his experimental laboratory — his stable loft. He presented his subjects with such enthusiasm and force, that their acceptance was irresistible, and we all went home from the meeting inoculated with new material for thought and reflection."

With these incontrovertible facts from Nature, he broke through the barriers of surgical tradition and stilted experience, and established as a requisite basis for surgical procedures, a knowledge of Nature's methods. Meeting all the requirements of an extensive and exacting practice in the daytime, he carried on at night, in association with Dr. M. E. Connell, at Wauwatosa, the enormous experimental work which evolved the splint principle of anastamosis, and the Senn decalcified bone plate in intestinal surgery, and, while the bone plate has become obsolete, the principles established and observations recorded in these experiments will always remain valuable in abdominal surgery. Who in that vast audience at the International Medical Congress, in Washington, 1888, could forget how that scientific body was held spellbound for two and one-quarter hours while he related his experiments on the intestines and demonstrated his specimens. What an outburst greeted "the Little Giant from the West," when he built the arch and placed the keystone in the structure of intestinal anastamosis, an enduring monument to American surgery.

This work was supported by his experiments on the blood-vessels, bones and joints, intercapsular fractures, hydronephrosis, surgery of the pancreas, etc. His was the first thorough work on the pancreas, and is referred to continuously; he was truly "the father of surgery of the pancreas."

His works are so well known that it would be superfluous to enumerate them. In surgical controversies from which he kept aloof his referendum was his experimental laboratory. His physical endurance was great; for years his average sleep was four hours. He had no time for frivolities, and little, if

any, for pleasure. He was always "engaged in a great and glorious work and could not come down." Gross, Fenger and Senn did for clinical, experimental, and bacteriological surgery in America what von Langenbeck, Billroth, and Volkmann did for German surgery.

As a teacher he was pre-eminent. He had the faculty of imparting knowledge with such force and precision as to command continued attention and produce lasting impressions. All this was due to his familiarity with the subject and the enthusiasm with which he was imbued.

"To be able to understand and appreciate the best that has been said and done is the fairest fruit of culture."— (Spalding). In this he was a striking example. His mind was a veritable library of all that had been done in medicine, surgery and the allied sciences. It was indexed and cross-indexed. He had assiduously studied the lives and works of others and their results were at his command. One was astounded to hear him in his clinics give the name and address of the author, the place and date of publication, of every important advance, and the statistics on any line of cases that came before him for examination and treatment. He had the faculty of presenting the salient points of clinical cases in such a terse and forceful manner, clothing them in such purity of diction, that they were ready for publication without revision. In addition, he was an ardent actor in the clinical arena, always enkindling enthusiasm, and creating a thirst for a deeper insight. He was in every sense an educator, never failing to arouse, inform, inculcate and inspire. His clinics were a veritable fountain of medical truths and virtues. His words were of wisdom, and his actions of thought. He did not found a personal school, as did von Langenbeck, Billroth, Pasteur and others, but he created a diffuse and general scientific professional sentiment that permeated the western hemisphere. Note the number and character of the men who received much of their early training and professional inspiration from him. "By their fruits ye shall know them." A teacher is known by the character and quality of men whose destiny he shaped or helped to shape. The doing and thinking surgeons of Western America are the products of Gross, Gunn, Fenger, and Senn. Senn's writings are extensive, and cover a wide range of thought; they show a profound surgical wisdom, as well as a keen discernment between the theoretical and demonstrable. He ever emphasized the practical application of principles.

His manuscripts constitute one hundred and sixty large volumes. A few of his writings only need be mentioned. His "Principles of Surgery," "Experimental Surgery," "Practical Surgery," "Tuberculosis of the Genito-Urinary Organs," "Tuberculosis of Bones and Joints," "Intestinal Surgery," "Pathology and Surgical Treatment of Tumors," "Surgical Bacteriology," etc., etc., are in every library, and are most important text and reference books. Some of his works are incomplete. This is easily accounted for by those who knew him. The speed with which he rushed from one field of activity into another and less cultivated zone, and one apparently needing his force and energy for immediate professional and general relief, caused him to leave works, accurately outlined and well under way, to others for completion. His every publication was a potent factor in the advancement of the subject. Dis-

semination of knowledge was one of his passionate delights, overtaxing himself both physically and mentally. His non-medical writings were frequent; his versatility and style were attractive, and his travel notes show he was a true medical explorer of distant and unknown countries.

As a man, he was of simple habits, retiring, and domestic. He formed few friendships, but those with fervor and loyalty. He never talked of originality or priority of action. He improved on the thoughts and works of his illustrious predecessors. He was, above all other things, a student. His greatest pride was in thinking and doing, not in acquiring.

He donated his services freely to the public; he was generous, in this particular, even to a fault. To medical education, he gave not only his time and energy, but munificent donations. One of these, a clinical building to Rush Medical College, is devoted to clinical and laboratory purposes, and cost approximately $100,000.

He had probably the best private medical library in America, including in it the library of Professor Wm. Baum, of Göttingen, and the collection of DuBois Raymond, all of which he donated to the John Crerar Library, for the use of the medical profession.

Senn was greatly interested in military matters. He was Surgeon-General of the National Guard of Illinois; he was Chief Operating Surgeon in the field during the Spanish-American war, with rank of Lieutenant-Colonel. He was the founder and President of the Association of Military Surgeons of the National Guard of the United States. He was Professor of Principles of Surgery and Military Surgery of the University of Chicago.

He was continually honored by the medical profession, having been President of the American Medical Association, and practically all of the leading medical organizations, and many times represented America at the International Congress, where he was always an honored and welcome member.

He was not faultless; to say this of him would be to misrepresent him, and he was good enough without the questionable advantage of false praise; the profession and people loved him, not for his defects, but in spite of them. He was apparently selfish in some things; men of genius always appear in that light, as their work is imperative — results must be attained. His lofty ideals and integrity of purpose dominated his every act, and controlled his destiny.

As years and wealth of knowledge accumulated, they, to him, seemed to open up an endless abyss of the unknown; stimulated a greater and more earnest desire, a more strenuous effort. The student of his motives can see in his labors an illustration of the beautiful words of Spalding, "Whatever purpose a man cherish, whatever task he sets himself, he finds his work stretching forth endlessly. The more he attains, the more clearly he perceives the boundless unattained." Senn laid down his labors when, to him, it seemed there was most yet to be accomplished.

JOHN B. MURPHY, M. D.

SURGERY, GYNECOLOGY AND OBSTETRICS

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CHRONIC CONSTIPATION

A CONSIDERATION OF ITS SURGICAL TREATMENT

BY W. ARBUTHNOT LANE, M. S., F. R. C. S.

Surgeon to Guy's Hospital; Senior Surgeon Hospital for Sick Children, London

THE term "chronic constipation," as generally used, does not include all the conditions which I intend it should in this communication. They are the consequences of the accumulation of material in the intestinal tract for a period considerably in excess of the normal. While in the large majority of cases this is associated with very infrequent hard motions, in a small proportion the motions are loose and frequent. This is particularly the case when the dilated and obstructed colon has been infected by organisms other than those that exist normally in it, with the consequent development of mucous, membranous and ulcerative colitis in their various forms. I thought of substituting for "chronic constipation" the term "chronic intestinal stasis", but there are many objections to doing so. I am, therefore, retaining the title, fully conscious that it is not sufficiently explanatory, for the reason that I do not know a better one to describe the pathological sequence to which I wish to call attention.

The subject of defective evacuation of the contents of the gastro-intestinal tract which I bring before your notice is of the greatest importance and interest, and, owing to the varying severity of the conditions consequent on this, there must be wide room for difference of opinion as to the advisability of surgical interference, as to the exact nature of such operative measures, should they be considered advisable or necessary, and as to the benefit likely to result from them.

Still, however our opinions may differ as to the treatment called for in any particular case, there can be no doubt that the pathological changes which are present in these conditions of imperfect drainage are most obvious and important. Any mechanical interference with the functions of the gastro-intestinal tract is far-reaching in its capacity for harm, and once the mechanism of the intestines has deviated materially from the normal, such alterations, together with the evil results consequent upon them, can be met only very partially even by extensive surgical measures.

In order that we may be in a position to discuss their treatment, we should understand clearly their mechanics, and I propose to describe them as clearly and as briefly as I can. You may not accept my description of these changes as accurate, or, if you allow their existence, you may regard the explanation given of their causation as incorrect. Yet I am sure that when your attention is called to them, if you have not already done so, you will take the first opportunity of testing their accuracy in the living body, and will not be merely satisfied to say that you have not previously observed them and that therefore you doubt their existence. Their presence or absence is capable of absolute demonstra-

tion. As to whether the nature of their causation as described is correct or not, I must leave to your judgment.

THE ALTERATIONS UNDERGONE BY THE GASTRO-INTESTINAL TRACT

The earliest and most conspicuous changes take place in the large intestine, which is practically the cesspool of the system, and these are most apparent in the first instance in its caecal portion and gradually extend to its termination.

The caecum becomes dilated and elongated, so much so that, when distended, it occasionally occupies the entire pelvis, displacing and compressing the viscera which normally occupy this space.

The portion of the caecum above the brim of the pelvis, together with the ascending colon, is retained in a position of abnormal fixity to the posterior wall of the abdomen. This is affected by the development of adhesions between the outer aspect of the large bowel and the peritoneum covering the abdominal wall in its vicinity. In advanced cases these adhesions are supplemented by a mesentery in which vessels of some size are contained. As a rule these adhesions merely fix the bowel, but occasionally they constrict its lumen very materially in one or more situations and render it liable to become obstructed. Not only do the adhesions anchor this part of the large bowel, but they also bind down to the iliac fossa a proportion of the appendix. They usually attach about a third or a half of its proximal portion, often terminating below in an abrupt, free margin, or forming a pucker in its normal mesentery. The acquired mesentery of the appendix is often distinct from its normal mesentery, while at other times it is intimately adherent to it. It becomes progressively shorter from its proximal to its distal limit, fixing this portion of the appendix so that its distal portion is more or less abruptly flexed upon its proximal part. In this manner the proximal portion of the appendix becomes part of the anchor or ties which oppose the downward displacement of the caecum and performs the function of a ligament, a purpose it was never evolved to perform.

A glance at this diagram (Fig. 1) explains the mechanics of the condition: 1 represents

Fig. 1.

the lower end of the caecum, which is shown in a distended condition; 2 the adhesions or mesentery fixing and retaining the caecum; 3 the continuation of 2, fixing the proximal portion of the appendix; 4 the proximal portion of the appendix dragged upon by the distended caecum and fixed by a progressively shortening acquired mesentery; 5 the distal portion of the appendix distended because of the obstruction which exists at the junction with the proximal part, and 6 the lower part of the normal mesentery of the appendix.

The result of this arrangement is that, when the caecum is loaded, it exerts a vertical strain upon the proximal portion of the appendix and causes that structure to become flexed abruptly at the lower limit of its adhesions. For the time being its lumen may be reduced or occluded at the junction of the distal and mobile portion with the fixed proximal part. The secretions of the former are dammed up, and an inflammation of the appendix of varying intensity is produced. The habitual obstruction to the escape of the excretions from a greater or shorter length of the appendix leads frequently to the formation of a solid mass of epithelial and other debris which may produce much harm by its presence.

Though the above is the common mode of fixation of the appendix, there are, however,

other varieties. For instance, if the distension of the caecum occurs at an early period of life, before its descent in the abdomen to the situation it subsequently occupies, the much elongated appendix may lie vertically behind the ascending colon and caecum, its upper extremity reaching high up into the loin posteriorly, being fixed by and involved in the acquired adhesions which bind down the outer wall of the ascending colon and caecum to the abdominal wall. Or adhesions may not form with sufficient rapidity or of sufficient strength to prevent the descent of the caecum into the pelvis. In this case the appendix also escapes fixation above the pelvic brim. When, however, the caecum becomes extended and inflamed, the appendix shares in the process and acquires adhesions in the true pelvis, which interfere with its mobility and result in occlusion of its lumen with its consequences. In such conditions the right tube and ovary are not uncommonly implicated. These variations of the caecum and appendix have been incorrectly described as retroversions to ancestral types, anatomical variations, etc.

The upper limit of the ascending colon is abnormally fixed and occupies a higher position than in the healthy subject. This is produced by the contraction of an acquired band of peritoneal adhesions which drag upon the flexure and help to oppose the downward displacement of the large bowel. This anchoring band is attached to the kidney and to the abdominal wall immediately external to it, the flexure being bound to them more closely and rigidly than normal. The increased intimacy of relationship of this viscus to the kidney and to the ilio-hypogastric, ilio-inguinal and last dorsal nerves is also of importance clinically.

Associated with the fixation of the caecum and ascending colon and the consequent limitation in its free functioning there is much wasting of the involuntary muscle wall.

The transverse colon forms a loop with its convexity downwards, and the limit to which this descends varies. A portion of the loop frequently occupies the true pelvis, reaching quite to its floor where it disputes possession of that cavity with the caecum which has usually occupied it previously.

The descent of the transverse colon increases the sharpness of the angle formed by the ascending colon with its proximal or descending limb, and also that formed by its ascending limb with the descending colon. The splenic flexure is also dragged upwards and backwards in an abnormal manner by a hypertrophy and contraction of the pleuro-colic fold, supplemented by other peritoneal bands of new formation, developed with the object of supporting the strain on this flexure exerted by the loaded transverse colon in the erect position of the trunk.

Where the descending limb of the transverse colon comes into contact with the ascending colon and caecum, adhesions retain them directly, while below a mesentery of variable breadth connects them indirectly. The same formation exists on the left side between the ascending loop of the transverse colon and the descending colon.

The presence of these mesenteries and adhesions renders any return of the transverse colon to its normal level impossible, while its further descent is favoured by their progressive contraction.

The descending colon is fixed in a manner similar to the ascending colon by adhesions and mesenteries attaching its outer surface to the peritoneum covering the adjacent abdominal wall.

I have illustrated diagrammatically in Figs. 2 and 3 this process of progressive fixation of the large bowel. The first figure represents a transverse section of the ascending colon or of the upper part of the caecum, the line B indicating the peritoneum covering the gut and the adjacent portion of the abdominal wall external to it, while the line A shows the position of the muscular and mucous coats. The arrows C show the direction in which fixation takes place, the adhesions beginning at the reflection of the mesentery from the outer wall of the bowel. These adhesions may exert such a strain on the bowel as to reduce its calibre very materially, especially at certain points. This is much exaggerated by any distension of the bowel below a constriction, and may be so great that the intestine becomes occluded at this point. Such an obstruction exists occasionally in the large bowel on the

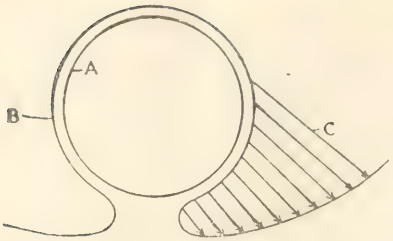

Fig. 2. Transverse section seen from above. A. Muscular and mucous coats; B. Peritoneum; C. Direction of adhesions.

right side at the level of the iliac crest, where the abrupt change from a firm, bony relationship to that of a flaccid muscular wall renders the production of a kink more easy.

Fig. 3 represents a transverse section through the sigmoid and meso-sigmoid and the peritoneum covering the iliac fossa external to the meso-sigmoid. As in the last diagram, the line B indicates peritoneum, and the line A the bowel. Owing to the possession of a mesentery of some considerable length, the bowel is at a much greater distance from the abdominal wall than the caecum and ascending colon, which are immediately adjacent to it, and the mode of fixation differs somewhat in detail from the last described. The outer surface of the mesentery is gradually brought down to its base by the formation of adhesions, till the wall of the sigmoid itself becomes secured to the floor of the fossa. The mode and direction of the formation of these adhesions are represented by arrows C.

Associated with the progressive fixation of the sigmoid loop, there is a diminution of its lumen and of its length, so that the bowel, which normally forms a loop of considerable size, moving freely at the end of a long mesentery, finally becomes telescoped as a short, straight, constricted tube, attached by a considerable area of its circumference to the abdominal wall quite devoid of any mesentery. In proportion as the bowel becomes fixed and unable to perform its functions with freedom and facility, so its muscular coat wastes. The state of fixation and shortening of the sigmoid flexure, wasting of its muscular coats and the general and occasionally also a very considerable local reduction of its lumen, the obliteration of much of its peritoneal covering, are of great importance surgically, since they interfere very materially with the passage of material through the sigmoid and render any operation on this portion of the bowel abnormally difficult.

The left ovary and Fallopian tube are often involved in these adhesions, and the adherent ovary very often undergoes a cystic degeneration. As it increases in size it forms a space in the acquired mesentery in which it moves, its outer wall and the lining of the space enclosing it re-acquiring a peritoneal covering.

By its growth it destroys those adhesions which attached the meso-sigmoid, leaving a mesentery connecting the sigmoid itself to the abdominal wall. As the tumour increases in size, it must destroy the residual mesentery and become free, except for its attachment to the broad ligament. How far the fixation of the left ovary in adhesions is responsible for the cystic degeneration it undergoes you must judge, but I have seen and demonstrated on

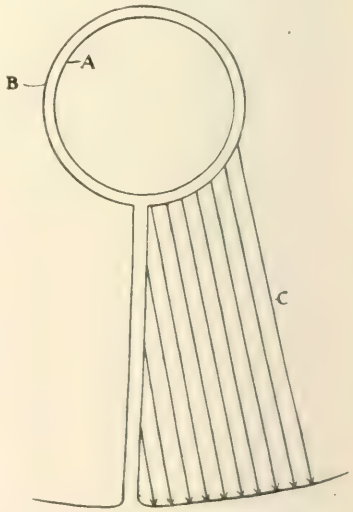

Fig. 3. A. Muscular and mucous coats; B. Peritoneum; C. Direction of adhesions.

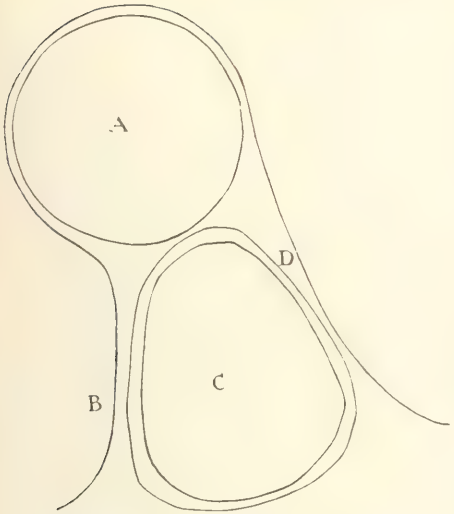

Fig. 4. A represents the sigmoid in transverse section; B the original mesentery; C the cystic ovary lying free in a cavity; and D the remains of the acquired adhesions.

numerous occasions the association of the conditions here described.

As in the case of the caecum, owing to the bowel having escaped beyond the control of adhesions, the sigmoid, instead of becoming shortened, atrophied, constricted, straightened, and fixed, becomes very much more elongated, dilated, and mobile than normal, its muscular coat being correspondingly hypertrophied. A certain amount of obstruction to the passage of faeces from the sigmoid into the rectum is present, since, when sufficiently elongated, the loop twists on itself. It is in these cases that complete intestinal obstruction may occur, owing to the twist or rotation of the overloaded and elongated loop becoming sufficient to prevent the passage of any material from the sigmoid loop into the bowel beyond. It will thus be seen that the so-called volvulus of the sigmoid (occurring spontaneously and not as an after-effect of an abdominal operation) is a phase of a condition of partial obstruction of long standing, the loop being habitually over-distended with intestinal contents, and the passage of faeces from it being chronically interfered with. I do not think that acute volvulus of a perfectly normal sigmoid can occur suddenly, spontaneously. The same remarks apply equally to volvulus of the caecum.

The rectum is usually elongated, dilated, and free from any abdominal adhesion. Its muscular coat is hypertrophied.

The stomach shows changes that vary in extent with the degree of descent of the transverse colon. It becomes dilated, its greater curvature reaching to an abnormally low level. Its upper margin is sometimes drawn up beneath the liver and ribs by a thickened and contracted lesser omentum, while occasionally the lesser omentum is stretched, thinned and elongated, so that the lesser curvature to the left of the pylorus occupies a position which is very much lower than usual. This retraction is most marked about the pylorus, which, with the commencement of the duodenum, is frequently attached to the under surface of the liver and gall-bladder by strong adhesions. It is obvious that the downward drag on the convexity, associated with the upward strain in the pylorus while the trunk is erect, must result in a progressive difficulty of evacuation of the stomach contents in the consequent further dilatation of that organ.

The posterior surface of the stomach is sometimes attached to the peritoneum covering the pancreas and adjacent structures.

The small intestines show changes which become more distinct as they approach the caecum. The lumen of the bowel is increased, while its several coats are abnormally thin and translucent. If a number of coils be collected in the palm of the hand, they remain flaccid and do not assume a circular form, but are jelly-like or diffluent in consistence. These characters all indicate considerable degeneration of the muscular and mucous coats.

Occasionally in advanced cases coils of small intestine are found to be attached to one another or to adjacent structures.

The kidneys are usually mobile. In many of the cases I have operated upon for chronic constipation, one or both kidneys have been previously fixed by operation, often without much benefit to the patient. The kidneys

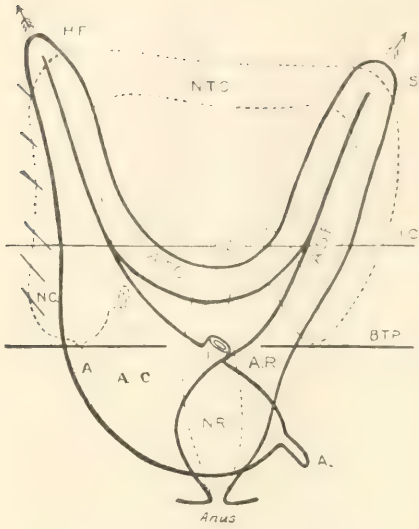

Fig. 5 represents diagrammatically many of the changes which the large bowel undergoes in consequence of the habitual interference with its functions by constipation. The normal condition is shown as a dotted line, while the firm outline illustrates the modifications which take place in consequence of habitual overloading. N. C., N. T. C., N. S. F., and N. R. indicate what may roughly be regarded as the normal caecum, transverse colon, sigmoid flexure and rectum, while A. C., A. T. C., A. S. F., and A. R. represent these parts in their altered state. B. T. P. and I. C. show the lines of the brim of the true pelvis and of the iliac crests. The appendix is left free from adhesions or deformity, so as not to render the diagram too complicated.

are rendered more or less mobile by two factors. One is the strain exerted upon them by the large bowel. As the drag exerted on the right kidney is usually much greater than that experienced by the left one, the mobility of the former organ is correspondingly greater.

The second factor in determining and facilitating the displacement of the kidneys is the absorption of fat, which is consequent on the auto-intoxication produced by intestinal stasis.

Progressive loss of fat and the increasing staining of the skin are perhaps the most marked objective features of this form of poisoning. They produce that appearance of premature age which is so characteristic of faulty intestinal drainage.

The rapid loss of fat and an associated degeneration of the muscles and other tissues are responsible for many other troubles. All the viscera of the abdomen are very much affected, losing their support, and resulting in a condition commonly described as enteroplosis. Obstetric disabilities are the direct result of the absorption of poisonous products from the intestinal tract. The loss of fat appears sometimes very abruptly, as if the tissues of the individual had continued for a long time to offer a sufficient resistance to the influence of the poisons and then suddenly gave up the struggle. In other cases the patient becomes gradually thinner. The skin is thin, sticky, inelastic, abnormally dark, and dirty-looking. The staining of the skin is partly general and partly local. It is at first a transitory feature and disappears with free purgation. Popularly the person is described as being "off colour" or "bilious."

The skin of the hands and feet is dark, cold and clammy, while that covering the back part of the upper arm is thick, coarse and blotchy in color.

Later the skin becomes permanently dirtier than normal, the tinge varying, however, with the degree of toxicity of the sufferer. Besides this general pigmentation, we find areas of exaggerated pigmentation corresponding usually to such surfaces as are exposed to friction, or are normally dark. For instance, the skin of the labia and anus, the inner aspects of the upper part of the thigh, the margins of the folds of the axillae, and the bend of the elbow. The skin covering the spines of the lumbar vertebrae, especially in women, the neck, the lower eyelid, and the area below it, the inner portion of the eyelids, and the prominent parts of the cheek and temple show this pigmentation in a very marked manner. The conjunctiva is also stained, first temporarily and then permanently, the colour varying in depth.

I would point out in passing, that the liver, probably from its bulk, has been blamed for much of the trouble produced by the faulty mechanics of the intestines, and drugs which hasten on their contents or possess antiseptic

qualities are given with the view of affecting that organ. I need only refer to mercury as an excellent example of this class. In operation for gallstones I have always found most definite evidence of defective intestinal drainage, suggesting that the infection of the ducts of the liver results from a damming back of organisms into a portion of the canal they do not normally inhabit.

This explains the benefit that so frequently follows in cases of inflammation of the gall-bladder, with or without gallstones, upon the stimulation of the passage of material through the intestines or its sterilization by drugs, such as olive oil, calomel, etc.

It is also possible that the development of adhesions between the pylorus and gall-bladder may so affect the functioning of the latter as to tend to the formation of gallstones.

The presence of the distended and inflamed caecum in the true pelvis interferes with the efficient performance of the functions of the ovaries and Fallopian tubes, and may produce adhesions of the tubes or ovaries. The breasts undergo a cystic change at an early period. In this way the intestinal stasis and the conditions associated with it are responsible for much of the sterility of women.

The presence of toxic materials in the circulation diminishes the resisting power of the tissues to the entry of organisms, and makes the sufferer a more ready victim to tubercle, rheumatoid arthritis, gout, gastric ulcer, and other diseases. In some cases the tissues are unable to resist the entry of the organisms thriving in the decomposing food about the teeth. The gum about the lower incisor teeth is the first to show this change. Infection of the gums, with destruction of the teeth and inflammation of the lymphatic tissues in and about the mouth and pharynx, serves to increase the gastro-intestinal disturbance by pouring deleterious matter into the stomach and by fouling the air entering the lungs. In advanced stages the skin has a peculiarly objectionable smell, most marked in the flexures. The flesh, when incised, has also a disagreeable earthy odour. This is particularly noticeable in operations on the abdomen where a large area of peritoneum is exposed.

THE MECHANICAL CAUSATION OF THE CHANGES DESCRIBED

The causation of the several pathological changes has been, to some extent, indicated in their description. It may be considered under two distinct headings.

First, there are the changes which ensue in consequence of the viscera being exposed to mechanical conditions other than normal in the process of evolution.

Secondly, we have to deal with the several degenerative processes which ensue on account of the absorption of toxic materials from the gastro-intestinal tract.

I have made it clear that the mechanical factor determining the several changes is an overloading of the large bowel, and especially of that portion which serves as the cesspool of the gastro-intestinal tract, namely, the caecum and ascending colon.

The excessive distension of this portion of the tract results very largely from the habitual assumption of the erect or sedentary posture during the greater part of the twenty-four hours in civilised communities. The mechanical interference resulting from this is exaggerated in the woman by the constriction of the waist, and by the imperfect development of the abdominal muscles, both due in great part to the use of stays. The abdomen of the woman is placed at a considerable mechanical disadvantage, as compared to that of the man, by its greater relative length, the thorax being encroached upon very considerably. To compensate for this, the upper part of the femoral thorax in the female is relatively larger than it is in man. This is requisite to meet the impairments of diaphragmatic and inferior thoracic respiration produced by the foetus in the later months of pregnancy.[1] In the act of defaecation in the sedentary posture, the viscera generally in the caecum and transverse colon in particular are driven downwards and forwards into the true pelvis. In this position there is a tendency to drag and displace downwards both kidneys, and especially the right. In this attitude the pressure afforded by the forcible apposition of the thigh and abdomen

[1] Pathology of changes produced by pressure in the trunk and shoulder girdle. Guy's Hospital Reports, 1886.
The mechanical factors which determine the variation in the form of the pelvis in the two sexes. Obstetrical Society's transactions.

which is exerted when the squatting position of uncivilized life is assumed is lost. In the squatting posture the forcible apposition of the thigh and abdomen empties the caecum and transverse colon, retains the kidneys and other viscera in position, and forcing up the segmoid which should exist as a freely mobile loop, the rectum is pulled upwards and straightened and the passage of faeces through it very materially facilitated. Besides the intra-abdominal contents are exposed to a far greater pressure than can be brought to bear on them in the sitting position. The apposition of the thigh also removes all risk of hernial protrusion through the inguinal and femoral rings during straining. In savage life the postures are infinitely more varied, the recumbent and squatting attitudes being assumed for long periods during the daytime. In many countries the squatting posture is employed during micturition as well as during defaecation.

The overloading affects, in the first instance, the caecum and ascending colon, distending this sac, stretching and possibly to some extent inflaming its coats. During the period in which the individual occupies the erect or sedentary posture material accumulates in the caecum and ascending colon. It produces a gradually progressive distension, so that the caecal extremity descends downwards and inwards into the true pelvis and exerts strain upon the attachment by peritoneum of the bowel to the iliac fossa and loin externally, and especially upon the hepatic flexure. The strain on the flexure in this position after a time renders it difficult or impossible for faecal matter to pass the flexure. The interference with the lumen of the bowel at the flexure is increased if there is also a quantity of faeces accumulated in the transverse colon. After a time material discharged from the small intestine into the caecum and ascending colon continues to occupy and distend these portions of the large bowel during the whole day, and it is only when the supine position is assumed at night that the mechanical conditions render the flexure pervious, and gravity assists in their evacuation. The same applies in a lesser degree to the splenic flexure.

I have already shown elsewhere, that whenever such a condition arises in the body as can be benefited by the formation of a new mechanism, or the modification of an already existing one, such an arrangement develops. Perhaps the best instance of this that I can point to of the development of an entirely new mechanism is the buttress which develops on the lateral mass of the atlas of the shoemaker, and which forms a new joint with the jugular process of the occipital bone. ("The Anatomy and Physiology of the Shoemaker," Journal of Anatomy and Physiology, July, 1888.) In the case of the vertical and transverse portions of the large bowel the weight is distributed along the adhesions and bands which extend from the outer surface of the transverse colon to the vertical portions, and from them to the adjacent abdominal wall, fixing them and pinning the flexures abnormally high up in the loin. Inflammation may ultimately play a part in the formation of these adhesions, but it is not solely responsible for their presence, as, if it were, the inflamed bowel would form adhesions to all structures in contact with it, and not merely where strain can be most effectually met by the formation of resisting bands.

The transverse colon drags upon the stomach, tending to pull it downwards. This tendency is opposed by the thickening and shortening of the right margin of the lesser omentum, supplemented by the formation of bands or adhesions, which extend from the undersurface of the liver and gall-bladder to the upper border and anterior surface of the pylorus and adjacent portion of the duodenum, and which hold up and fix these structures at an abnormally high level.

In consequence of the drag exerted by the bowel on the convexity of the stomach and the upward displacement and fixation of the pylorus, this organ experiences a progressive difficulty in emptying its contents while the erect position is assumed and dilatation ensues. The coats of the stomach become more or less inflamed, the posterior wall of the stomach forms adhesions to the structures adjacent to it. Ulceration of its mucous coat is not uncommon. A knowledge of these facts helps to explain the benefit experienced by cases of dilated stomach who are treated by being retained in such a position that this viscus is freed from the strain exerted upon it by the

large bowel. It seems to me that there is much obscurity as to the causation of dilatation of the stomach as well as of many digestive changes, for the reason that the more simple mechanical aspect of the condition is neglected, while the more elusive chemical results of such processes are pursued instead.

I have already called your attention to the liability to ulceration of the stomach of patients suffering from intestinal stasis.

In cases which I have operated on for gastric ulcer, either because of pain, haemorrhage or perforation, I have found the stomach dilated and often hypertrophied together with all the changes which I have described as consequences of chronic constipation. As a further proof that the ulceration of the stomach is secondary to interference with the passage of material from it, I would remind you of the success which almost invariably follows upon the removal of the obstacle by the effective drainage afforded by gastro-enterostomy.

It is not impossible that the toxic condition present renders the mucous membrane less resistant than normal to the irritating action of the contents of the stomach delayed for too long a period in it.

Fig. 6 represents: (1) The dilated caecum and ascending colon, with the appendix involved and distorted by the lower limit of the adhesions; (2) which fix this section of the large bowel; (3) the elongated and dilated transverse colon with the acquired mesenteries; (4) between it and the ascending and descending colon. These serve to transmit to the vertical portions of the large bowel much of the weight of the transverse colon. The remainder of the strain exerted by the transverse colon is exerted along the great omentum; (5) to the greater curvature of the stomach. This strain is also met partly by the acquired adhesions; (6) which overlap and hitch up the pylorus, and partly by the adhesions 2 and 7, which fix the ascending and descending colon respectively.

THE TOXIC CAUSATION OF CHANGES DESCRIBED

The absorption of toxic material produces a degenerative change in all the structures of the body. The heart and vessels show marked evidences of decay. The hands and feet are cold, clammy, patchy, and bluish. The voluntary muscles become pale, wasted, and abnormally friable, and fat disappears from the tissues. I have already described the changes which are produced by the toxins in the skin.

The clinical symptoms vary also, as they are brought about by the over-loading of the intestines and the consequences which ensue on it, or by the absorption of toxic material from some portion of the gastro-intestinal tract.

The material harm done directly or indirectly by imperfect intestinal drainage is infinitely greater and more far-reaching than that ascribed to alcohol, while the misery inflicted on the individual, as well as on those brought into constant association, is often very intense, and though the depression of mind and body produced by it sometimes drives the sufferer to find refuge from the one or a stimulus to the other in alcohol, it is very unusual for those who are addicted to alcohol to suffer from intestinal stasis.

While in the large proportion of cases of sluggishly acting gastro-intestinal tracts constipation exists in varying degrees of severity, a certain number of patients obtain a daily evacuation, a surplus being discharged daily from an over-loaded cesspool. In an even smaller proportion of cases diarrhoea may exist, the patient having several fluid and often offensive evacuations, one following immediately on a meal, or there may be alternating periods of constipation and diarrhoea. The diarrhoea may be of a very irritating character, and much mucus, or even mucous

casts, or blood may be present in the motion. Indeed, some infection of the colon is not a rare complication.

We will now consider the clinical symptoms which are associated with the altered mechanical conditions of the intestines.

In the first instance, I think we may assume that what is commonly called indigestion is the earliest factor in the determination of the delayed functioning of the gastro-intestinal tract consequent on the altered condition of the intestines, which results from improper feeding. This, by diminishing the general energy and the respiratory capacity, assists in reducing progressively the ability of the several portions of the body to perform their normal functions, and impairs still further the manner in which the drainage apparatus does its work. Indeed, indigestion in one form or another may be regarded as a usual concomitant of delayed and obstructed drainage. The frequent distension of the appendix, caecum, ascending colon, transverse colon, and subsequently of the small intestine and stomach, produces feelings of illness, physical and mental inactivity, nausea, vomiting, flatulence, or pain, which are in part due to the more local distension determining a reflex upset of the whole tract, and partly to the toxic influence exerted by the ptomaines absorbed by the mucous membrane.

The patient experiences considerable discomfort, tenderness, or pain over the caecum and ascending colon. This may extend downwards and inwards over the middle line into the true pelvis. Associated with this there may be pain and tenderness below the last rib on the right side, and often along the distribution of the ilio-inguinal and ilio-hypogastric nerves. The pain in the loin, and that reflected along the nerves, increases as the day goes on. They occasionally simulate very closely the pain of stone in the kidney, and have frequently led surgeons to explore the right kidney. Finding nothing in the condition of the kidney to account for the pain, the surgeon has been disappointed, but more often than not the patient has been relieved for a time. The surgeon has easily explained this post-operative amelioration of symptoms on the ground that an operation on the abdomen, though apparently unsuccessful, may do good by impressing the patient morally. In this case, as in most others, there is no necessity to draw on one's imagination, since the procedure necessary to explore the kidney thoroughly liberates the attachment of adhesions and bands pulling on the hepatic flexure, and frees the bowel for a longer or shorter period from the obstruction, the real cause of the symptoms. The position of recumbency is also partly responsible for the improvement, since in that posture drainage is carried on more efficiently.

The pain immediately below the last rib is due partly to the drag exerted upon this area by the adhesions when the patient is in the erect posture, and when in the supine posture from the backward thrust of the upper extremity of the distended bowel. The same traction exerted upon the last dorsal, ilio-inguinal and ilio-hypogastric nerves accounts for the reflex pain described, which simulates renal irritation.

A little consideration of the mechanics of the big bowel shows that while the caecum and ascending colon have great difficulty in passing on their contents in the erect posture, their evacuation is very much facilitated by the assumption of the supine position, and this may be increased still further if the pelvis is raised by elevating the foot of the bed. The increased facility of evacuation of the faeces from the cesspool in the supine posture probably accounts for the morning evacuation of civilised life.

When the lower part of the distended caecum occupies the true pelvis, a dull pain is experienced over the sacrum about the right sacro-iliac joint. This pain is much exaggerated during defaecation, when the patient has a sensation of an obstacle in the bowel which cannot be overcome. Straining drives the large, engorged and inflamed caecum further downwards and perhaps into the pouch of Douglas and makes matters worse. The patient may be unable to lie on the left side, owing to the drag exerted by the loaded caecum.

The transverse colon sometimes produces considerable discomfort or pain. Its position, like that of the remainder of the large bowel, can be defined by the hands as it descends to

the brim of the true pelvis. When the splenic flexure is obstructed, the patient complains of a griping pain along the course of the ascending portion of the distended and elongated transverse colon, and of a dull aching pain in the left loin about the last two or three ribs. This last pain is produced in the erect trunk by the drag and in the supine posture by the thrust of the loaded bowel.

The fixed and shortened sigmoid is often very tender on pressure, and can be readily felt in its abnormal situation. Severe pain may be complained of during the passage of faeces through it. This pain may be so great as in some cases to leave the patient quite collapsed. In a considerable number of cases, the pain in the sigmoid is the reason the patient sought for relief. The abdomen is fuller than it ought to be, and a little careful manipulation shows the presence of a quantity of fluid in the small intestine, and particularly in the ileum, where material accumulates because of the difficulty of its entry into the caecum.

The diminution in respiratory capacity, which is brought about in consequence of indigestion in young people, is a matter of vital importance and is a very material factor in lowering the activity of all the vital processes in the body. In the first instance, deficient oxygenation results from serious alterations in the abdominal mechanics. Later a vicious circle is formed, the defective aeration impairing the digestive processes.

Very soon after birth, in the state of civilization familiar to us in this country, the imperfect nature of the food supplied, which is not often material in origin, produces disturbances of the gastro-intestinal tract and consequent imperfect nutrition. Now, in infancy, indigestion is a very much more serious condition than it is in adult life; indeed, one may safely generalise by saying that the harm done by disturbance of the gastro-intestinal tract varies inversely with the age of the child. In young life, the supply of nutritive material derived from the intestines has not only to meet ordinary wear and tear, but an excess has to be obtained from which to form new tissues, and the growth of the child depends largely on the amount of this balance. As the process of digestion is vastly more active in infancy, the facility with which it is interfered with is correspondingly great, and the consequence of such upset is far-reaching and disastrous.

The result of indigestion in the infant is to produce an inflammation and distension of the intestines and irritation and enlargement of the lymphatic glands draining the tract through which material passes, probably in an abnormal state, setting up troubles and disturbances in transit. Associated with these conditions and in consequence of them, a varying quantity of serous fluid is thrown out by the irritated peritoneum. The general depreciation of vitality and the formation by the inflamed glands and the peritoneal effusion of suitable culture media, render the abdomen of young infants a very common seat of tubercle.

An examination of the left ovary may show that it is fixed and, in many cases, that it has undergone definite cystic change. It is often very sensitive, probably because its fixation prevents its eluding the pressure of the fingers.

The mental depression and depreciation associated with this form of poisoning are remarkable, the patients being unable to concentrate their attention on anything; they are sometimes so drowsy as to appear to be under the influence of a narcotic. The toxic symptoms increase during the day and may necessitate recumbency about or before noonday. This position having relieved the obstructed drainage of the caecum, the patient is able to make a fresh start. These patients are liable to attacks of faintness, giddiness, neuralgia or headache, due to the presence of a large quantity of toxic materials in the circulation, or to pressure on the heart by distended stomach or bowel, or to both. Loss of control over the temper is also a very marked feature.

The progressive loss of fat and the increasing staining of the skin are perhaps the most marked and serious features of this form of poisoning. These two conditions especially combine to produce that appearance of premature age so characteristic of faulty drainage. Their onset affords definite evidence that the body has become unable to resist the influence exerted by the poison upon it, and unless this deleterious influence be met effectually, degen-

erative processes proceed at a rapidly increasing rate.

I have already demonstrated the mechanical relationship of so-called "appendicitis" to overloading of the cesspool or caecum, and as its symptoms are more or less generally known, I will not allude further to them here. I say more or less generally known, as there is a remarkable tendency to ascribe to the appendix any tenderness present in or about a line which extends from the anterior superior spine of the right ilium to the umbilicus. Those making this mistake have, however, the satisfaction of knowing that if the appendix is not the cause of the trouble its excision involves practically no risk. It can be removed through a very small hole, the comparative minuteness of which, and the very brief convalescence which ensues, gratify the operator and the patient, and suggest great skill. The operation frees the patient from a possible danger, and the surgeon explains the freedom from inflammation of the appendix on the supposition that between attacks it may be quite normal. While the patient remains on the back during convalescence, the absence of symptoms also suggests success, this opinion being only modified by the subsequent course of events.

The presence of the distended and inflamed caecum and appendix in the true pelvis probably interferes with the efficient performance of the functions of the ovaries and Fallopian tubes, and in some cases matting of the tubes or ovaries results in consequence. The presence of toxic material in large quantity in the blood causes a loss of pelvic fat and a want of tone in the muscle of the uterus, etc., and interferes with the perfect functioning of the organ and its appendages.

When the stomach has become dilated, the symptoms due to it become an additional feature of the case. I have only referred indirectly to the attacks of acute obstruction of varying degrees of completeness and severity which may arise from interference with the passage of faecal material from the caecum into the ascending colon, from the ascending colon into the transverse colon, and from the transverse colon into the descending colon.

A knowledge of the mechanics of the changes which ensue in the large intestine will readily enable the surgeon to diagnose these conditions and to differentiate them from trouble in the stomach, kidney, gall-bladder, appendix, uterus, or rectum, to all of which structures I have frequently known them attributed.

In the treatment of such degrees of overloading of the large bowel as cannot be treated efficiently by measures short of operation, I have obtained considerable success by dividing constricting bands and adhesions, and by subsequent careful attention to the proper functioning of the bowel. In a considerable proportion of cases, and more particularly in women, such means are insufficient, as at the best they only afford temporary relief, since the obstruction recurs sooner or later.

In my earliest cases, after the appendix had been removed and the caecum and flexures freed from adhesions, on one or more occasions without any other than transitory benefit, I looked about for some means of relieving the patients of the caecal pain from which they suffered and for the relief of which they were ready to submit to any operation. Pain was the chief symptom of which they complained. I mention this as it has been suggested that I was led to remove the caecum by Metchnikoff's excellent work. Unfortunately I was unaware of it at the time. I did not appreciate the importance of the toxic effects till I observed their almost sudden disappearance after division of the ilium. In the first case I merely made a lateral anastomosis between the ileum and sigmoid, but the early return of caecal pain obliged me to divide the ileum. In several of these cases after an interval of months the patients were occasionally annoyed by the presence of hard dry masses of faecal matter in the caecum. These produced no auto-intoxication, but the discomfort arising from the pressure was sufficient to make me remove the large bowel as far as the splenic flexure. They are not necessarily the result of regurgitation, but are probably secreted by the large bowel. A still more extended experience showed me that if any portion of the large bowel is left above the junction with the ileum, it tends to dilate sooner or later. This dilatation may interfere with the satisfactory evacuation of faeces, and

discomfort or pain may ensue because of its distension by faecal matter or gas. Therefore to overcome the constipation as well as the septic absorption, the large bowel should be removed as far as its junction with the ileum which is affected in the upper part of the rectum or in the adjacent sigmoid.

Therefore, when I recognise that the mechanics of the intestines have been altered to a degree that cannot be rectified satisfactorily by the division of bands, etc., I divide the ileum at a distance of about five or six inches from the caecum. This can be done rapidly and securely by applying a strong compression forceps on the ileum, so as to reduce the bulk of the coats to the minimum possible.

As the forceps is removed, the compressed band of bowel is ligatured by means of a sufficiently stout ligature. The ileum is divided by the cautery immediately beyond the ligature. The stump is then buried in the proximal bowel by means of a purse-string suture which encircles the bowel about three quarters of an inch above its ligatured extremity, rendering the closure absolutely secure, and perforates its peritoneal and muscular coats. (Figs. 7 and 8.)

The acquired adhesions and peritoneum which bind the caecum and ascending colon to the abdominal wall external to them are divided and the bowel is raised till the vessels which supply it are exposed. These are grasped in compression forceps and firmly ligatured. The vessels supplying the transverse colon are similarly treated, and finally the descending colon and sigmoid are removed, the rectum or the lower part of the sigmoid being occluded in the same manner as the ileum.

I had usually been satisfied to divide the transverse colon at the splenic flexure, closing the distal portion in the manner already described, but for the reasons I have given I now remove the descending colon and the sigmoid, closing the large bowel at or just above its junction with the rectum.

The termination of the ileum and the rectum adjacent, to it are brought into convenient apposition, and a perfectly secure and reliable lateral anastomosis is made by means of a double row of continuous sutures, the inner

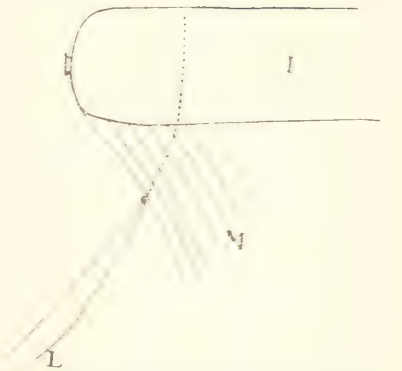

Fig. 7 shows the ileum, ligatured and divided: L represents the suture which is passed beneath the peritoneum of the mesentery (M) and of the bowel (I,) which it encircles transversely.

row of which perforates all the coats, while the outer does not enter the lumen of the bowel.

If the surgeon prefers it, the ileum and rectum may be united end to end. This is the better way, since any tendency to pouching which exists in the case of lateral anastomosis is avoided. The objection to it is that it is not so absolutely safe because of the difference in the circumference of the two pieces of bowel, the frequent great tenuity of the wall of the ileum, and the difficulty occasionally met with in dealing with the mesenteric attachment.

Finally, a fine gut ligature is passed through the free incised margin of the mesentery of

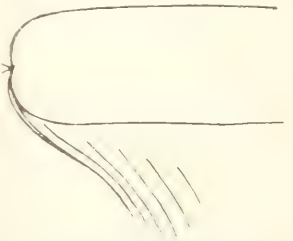

Fig. 8 shows the condition present when the ligatured stump of bowel has been invaginated by means of forceps within the limits of the encircling suture, which has then been drawn tight.

the ileum, and then beneath the peritoneum forming the outer wall of the meso-rectum. This, when made tight, brings the rectum to the middle line of the pelvis and fixes it securely in that situation immediately beneath the position occupied normally by the divided end of the ileum. The ligature also closes the interval between these two mesenteries through which a loop of bowel might otherwise pass and give trouble.

If, however, the condition of the patient is very unsatisfactory, or if for any reason the removal of the large bowel is unnecessary, very difficult or dangerous, I am satisfied to divide the ileum and connect it with the sigmoid or rectum. If necessary, the large bowel can be removed later when circumstances have altered.

The stomach is exposed and is usually found to be dilated to a varying extent. In this condition the pylorus is hung up by adhesions to the liver and gall bladder. These are freely divided. I have employed gold leaf to obviate the reformation of adhesions with apparent advantage. Those adhesions tend to reform. When the weight of the transverse colon has been removed, during the period of recumbency following on the operation the dilatation of the stomach usually disappears more or less completely. On several occasions after a varying interval from the operation of resection of the large bowel the dilatation of the stomach has become a feature of sufficient importance to require its more effective drainage by a gastro-enterostomy. This operation has afforded complete relief of the gastric symptoms. Curiously enough, I have seen cases of chronic intestinal stasis in which a gastro-enterostomy alone has been done with very distinct disadvantage to the patient. To attempt to relieve symptoms by performing a gastro-enterostomy in the first instance, is of little avail.

The kidneys often become so mobile as to necessitate their fixation. The operation which I have performed with uninterrupted success for this purpose is one I devised and described in the Transactions of the Clinical Society, 1892, in "A case of floating kidney treated by a mode of nephrorrhaphy."

Should the blockage of the bowel be of sufficient severity and duration to have resulted in adhesions of the small intestines, it is well to examine it along its length and divide such adhesions and bands as effectively as possible.

In certain circumstances it may be necessary to consider the advisability of establishing lateral anastomosis between anchored loops of the small bowel liable to obstruction, or, if convenient, to divide the ileum above the obstruction in it.

In a severe case in which the small intestines were pinned down and obstructed in many places I freed the adhesions and removed the large bowel. At a subsequent operation for freeing the pylorus, I found the small intestine had recovered its normal condition and that all evidence of previous adhesions had disappeared. This suggests that adhesions of the small intestines may disappear after the removal of the large bowel.

In volvulus of the caecum producing acute obstruction, if the condition of the patient permits of an operation somewhat longer than that of merely replacing or draining the distended bowel, the ileum is divided and connected with the rectum. If the conditions are favourable, the large bowel may be excised, but if not, it may be done later, should it give trouble.

In volvulus of the sigmoid the treatment varies with the conditions present. In cases of moderate severity a good result can be secured by imitating the process which takes place usually in chronic constipation, namely, the shortening of the meso-sigmoid and the fixation of the sigmoid. This can be effected by a number of continuous sutures attaching the meso-sigmoid, and then the sigmoid to the peritoneum lining the adjacent abdominal wall. When the sigmoid is enormously dilated and acutely inflamed, two modes of treatment suggest themselves. On two occasions, after draining and washing out the bowel, I have excised the entire loop and obtained a perfect junction. I employed a Murphy's button for this purpose, as, owing to the very considerable difference in the calibre of the two sections of the bowel, their fixation to the iliac fossa, and the condition of the patient, it was practically impossible to connect them in the usual way by sutures. As cases may arise at the time or

subsequently as seems wise in circumstances in which sufficient assistance is not available, a more simple procedure is to drain and to irrigate the loop, and to establish a large lateral anastomosis of the loop itself near its base, dividing and closing each limb of the loop beyond the junction. I have also cut through the limbs of the loop just beyond the margin of the abdominal wound and have established an end-to-end anastomosis.

Except in patients who are supremely toxic and feeble, the removal of the large bowel is accompanied with little risk. If, however, the obstruction be acute and the intestines and abdomen be distended, the risks are rather those of the condition calling for interference than of the operation itself. Except in very advanced cases, in which the small intestines have become adherent to one another, and consequently liable to obstruction, this operation affords the patient more or less complete freedom from all the symptoms which existed previously, the amount of relief varying inversely with the changes which have arisen in consequence.

In my earlier cases vomiting was a very troublesome feature. It frequently continued for several days after the operation. This can be readily obviated by the introduction of considerable quantities of normal saline solution subcutaneously during the three days following the operation. I am encouraged by recent experience to believe that the formation of adhesions which occasionally follows the removal of the large bowel is obviated by this treatment.

I would urge operating at a sufficiently early date. If you delay interference till the small intestines have been habitually distended with faecal contents, and their walls have become thinned and their muscle wasted and inefficient, till the stomach has also become affected, and the gastro-intestinal tract has got into the habit of performing its functions in a dilatory and unsatisfactory manner, you will obtain only a partial amount of benefit from the operation. It would seem that once the involuntary muscle-fibre of the intestine has become overstrained by the pressure exerted upon it over a long period of time by the intestinal contents, its recovery is very slow and imperfect.

BONE SARCOMA: DIAGNOSIS, PROGNOSIS, AND TREATMENT[1]

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SARCOMA of bones practically includes all cases of malignant disease of the bones, as there is but a very small number of cases of carcinoma of the bone, and these are always secondary to a primary tumor in the soft parts. I have seen 4 cases of carcinoma of the femur, which were secondary to carcinoma of the breast; and 3 cases of carcinoma of the spine, secondary to carcinoma of the breast.

Sarcoma of the bones forms a very large part of the total number of cases of sarcoma. My own series of cases, observed since 1890, shows 234 cases of sarcoma originating in the bone out of a total of 630 cases of sarcoma in general, i. e., 37 per cent.

There are certain bones that show a peculiar predisposition, if one might so call it, to sarcoma, and yet, if one analyzes the cases, it will be seen that the bones most frequently attacked by sarcoma are the bones that are most exposed to external injury. The most frequent sites in my own series are the following:

Femur, with	39
Superior maxilla	32
Orbit	22
Humerus	15
Tibia	13
Ilium	14
Clavicle	10
Scapula	9
Skull	6
Spine	6

[1] Read before the American Orthopedic Association, Washington, D. C., May 8, 1907.

A glance at this list will show that the bones most frequently affected are those which are most liable to external injury.

While the limits of this paper do not permit me to dwell upon the etiology of sarcoma of the bones, I may be allowed to say that of all theories that have been offered to explain the cause of cancer, that of the microparasitic origin of the disease is the one most nearly in accord with known clinical facts. In no other way can one explain the development of periosteal sarcoma of the femur or humerus, immediately following an injury with rapid generalization through the blood vessels, causing death within a few months. The influence of trauma as a direct causative factor in malignant disease, and particularly in sarcoma of the bones, can no longer be doubted. Our histories to-day, taken with much more detail and far greater care than a generation ago, all show a strikingly large proportion of cases (more than one third) with antecedent local injury. We have reason to believe that the infectious cause of sarcoma, whatever it be, may remain latent for a long time, or perhaps indefinitely, in the system without harm, until the injury produces such a lowering in the local vitality of the parts and of their resisting power, that the slumbering process becomes active and the neoplasm begins to develop.

DIAGNOSIS OF SARCOMA OF THE LONG BONES

The most important step towards making a correct diagnosis is to obtain a careful clinical history of the case, the following points being of special importance:

1. The age of the patient.
2. Presence or absence of a history of local injury.
3. Hereditary influence, bearing in mind the fact that sarcoma not infrequently occurs in persons whose relatives died of carcinoma.
4. General health of the patient may aid in differentiating sarcoma from tubercular disease; patients suffering from sarcoma, especially in the early stages, being usually persons in the most robust health.
5. Previous history of syphilis.
6. Location of the swelling as regards proximity to a joint.
7. Presence or absence of pain.
8. Duration of the growth.
9. Periosteal or central origin of the tumor.
10. Consistence of the tumors (presence or absence of fluctuation).
11. X-ray examination.
12. Examination of the blood.
13. Microscopical examination of a section removed either with a tumor punch or by exploratory operation.

In sarcoma of the long bones a history of trauma is even more frequent than in sarcoma of the soft parts. Gross found it in 70 cases in a total of 144 cases; Mayer found it in 31 per cent of cases; Reinhardt in 16 per cent of cases; Nasse in 15 per cent of cases; Kocher in 20 out of 65; Ziegler in 67 out of 171. My own cases show accidental injury in 31 cases out of 66 in which the presence or absence of trauma was noted, or 47 per cent. In 3 cases the sarcoma developed at the site of a fracture.

The condition that most closely resembles sarcoma of the bone is tuberculosis of the bone; its similarity is often so great that the most expert diagnosticians have failed to differentiate the two conditions. In some cases it may be quite impossible to make a diagnosis without the aid of a microscopical examination of a specimen removed, but inasmuch as there are certain risks connected with these exploratory incisions, it is most important to be able to make a diagnosis, if possible, without such aid. In the great majority of cases of sarcoma of the long bones, the following clinical picture will be found to be sufficiently accurate to enable one to render a correct diagnosis: The patient will almost always be between 10 and 50 years of age, the majority between 20 and 40; general health will be perfect; there will be no family history of tuberculosis and no evidence of previous tubercular lesions. There will be a history of local injury of some sort in one third to one half of the cases — a blow, a fall, a fracture, a severe sprain — at some longer or shorter interval, usually less than six months, prior to the first appearance of the tumor. The first symptom the patient will have noticed will be local pain or local swelling, in about equal proportion of the cases. Gross states that pain occurs as first symptom in 62 per cent of the cases, a tumor in 33 per cent. In many of my own cases pain has been absent as an early

sign, and not of great severity until the later stages of the disease. The cases in which pain has been an early symptom have usually been treated for rheumatism for a longer or shorter time. In upwards of two thirds of the cases of sarcoma of the long bones the tumor will be found located in one end of the bone, the lower end in the femur, the upper in the tibia and humerus, probably starting in the epiphysis, but very rarely invading the joint, except in the later stages of the disease. In a few cases, especially those of the femur and tibia, it begins in the middle of the bone, and here it is nearly always the periosteal type, forming a fusiform enlargement of the shaft in the early stages when the diagnosis is important and treatment of value. The duration of the tumor or rapidity of its growth is also an important diagnostic sign. In nearly all cases the rate of growth is much more rapid than in either tuberculous or syphilitic swellings. In tuberculosis the joint is early invaded; there is more limitation of motion in the joint and more atrophy of the muscles of the limb above. Seen in the later stages, when the whole joint is affected by the disease and the patient has become emaciated and exhausted, the similarity of sarcoma to tuberculosis is very great.

The consistence of the tumor in sarcoma varies greatly with the type of tumor. In growths of periosteal origin, in the early stages, the consistence may be very firm; later on, when the tumor has reached considerable size, especially in the round-celled variety, the consistence may be very soft and semi-fluctuating, the tumor itself being soft and mush-like in appearance. In other cases of periosteal sarcoma, while the consistence of the tumor in general may be quite firm, there may be areas of marked softening and, in some instances, fluctuation due to the liquefaction of bone or cartilage. The introduction of a sterile needle with the withdrawal of clear serum will enable us to differentiate the condition from tuberculous abscess. In still other cases, particularly the myelogenous sarcomas of the upper end of the tibia, the tumor may show areas of softening similar to those described and other areas which, on palpation, give the egg-shell crackling sensation which is fairly characteristic of the disease.

The temperature may offer some slight help in the diagnosis. A regular evening rise of temperature of 1° to 2° would be slightly in favor of tuberculosis, although it is not at all infrequent to find slight, irregular temperatures in sarcoma of the femur even in the early stages.

I have on several occasions observed a temperature of 99½° to 100° or 101° in sarcoma of the femur, and in some cases of sarcoma of bony origin I have seen a temperature of 103°.

In the very rapidly growing sarcomas of the bone the tendency to rise of temperature is more marked. Involvement or non-involvement of the joint is of the utmost importance in differentiating the two conditions. As stated before, in sarcoma the joint is very rarely involved, never in the early stages, except in the exceedingly rare cases where the sarcoma begins in the synovial membrane (Rydygier). Only 9 cases have been reported.

Examination of the blood shows nothing at all characteristic. There is apt to be a slight leukocytosis, which may reach from 15,000 to 20,000, and occasionally there is an increase in lymphocytes, also an increase in the eosinophiles.

The contour of the tumor is of considerable importance. In tuberculosis starting in the epiphysis and soon involving the joint, the clinical picture is very different. There is swelling of the whole joint, more or less symmetrical, while in sarcoma, especially of the femur, the swelling is apt to be unilateral or more or less irregular, and does not extend into the joint, but further up the shaft of the femur than is seen in tuberculosis. Not infrequently there are areas of softening or fluctuation in sarcoma, which can be made out on deep palpation and are due to the formation of a cyst by liquefaction of bone or cartilage, but this fluctuation almost never communicates with the joint, a fact which enables us to differentiate the trouble from tuberculosis. The color of the skin may be of significance; it is less pale than found in tuberculosis, and at times distended veins give it a bluish color.

While it is always wise, if possible, to have an X-ray photograph made of the tumor, in many cases nothing characteristic will be found, except perhaps in the later stages when the diagnosis is easy without the X-ray. In the

early stages. I agree with Butlin it is not only of little help, but in certain cases entirely misleading. The X-ray may be important in showing periosteal or central origin of the tumor, but I do not agree with Kramer in regarding it as a valuable aid to diagnosis in the early stages.

The differential diagnosis between sarcoma and syphilitic lesions is not nearly so difficult. There will usually be found evidence of syphilitic trouble elsewhere in the body, even if no history of primary disease can be elicited. In addition to this, the fact of the much slower growth, the location of the tumor in the shaft of the bone rather than the extremity, will be sufficient to establish the diagnosis. There is one other condition, to which I have not seen attention previously called, but which in a case personally observed was mistaken for sarcoma by surgeons of great experience, and that is osteo-arthritis. In this case the X-ray was of decided help, as it showed a much larger amount of new bone formation and this formation much more irregular in character than is often seen in sarcoma. In addition the marked, almost complete ankylosis of the joint was most significant. Finally, further examination showing typical osteo-arthritic enlargement of every joint in both hands, made the diagnosis of osteo-arthritis of the knee certain.

In some cases, and perhaps in the majority, it is be important to establish the diagnosis before the clinical signs are sufficiently marked to render this possible with any degree of certainty. In these cases we may remove a portion of the tumor either by means of a tumor punch, or, better, a simple exploratory incision. I believe that certain risks are attached to these preliminary explorations, due to the possibility of infected cells getting into the circulation, thus setting up metastases in other portions of the body. The advantages, however, to be gained by such positive knowledge of the nature of the growth, enabling the surgeon to apply immediate treatment, whether it be amputation or injections with the mixed toxins, far outweigh the dangers from exploratory incision. If the patient is put upon the toxins within a few days thereafter, I believe that whatever cells may have been carried through the circulation will by that time still

Fig. 1. Sarcoma of femur. Three weeks' duration following a kick.

be in a state of such unstable equilibrium, that they will probably be destroyed by the toxins. As a matter of fact, the early appearance of metastases after amputation in cases in which no preliminary exploration was made, has proved that the infected cells enter the circulation early in the disease.

I believe it is impossible, in many cases, to make a differential diagnosis between sarcoma and cyst of the long bones, without a careful microscopical examination. In a few cases one may be able to differentiate the two conditions from the following points:

1. Cyst of the long bones is very rare, D'Arcis, in 1906, having been able to collect from the literature but 31 cases.

2. Nearly one-half of the total number of cases have been found in the upper end of the femur, a relatively infrequent seat for sarcoma. Six occurred in the upper end of the tibia, six in the upper end of the humerus.

3. Another important point is that cysts of the long bones are, as a rule, of much longer duration than sarcoma. A history of trauma and spontaneous fracture are found with almost equal frequency in sarcoma and cyst. It should be remembered that many cases reported as cysts of bone were probably sarcoma, as no microscopic examination was made.

If a tumor has developed immediately after an injury and has attained considerable size within the short period of two to three weeks, especially if associated with a certain amount of temperature, there is often a tendency to regard such a tumor as inflammatory rather than malignant. I have recently had two cases which proved that such conditions are not inconsistent with sarcoma.

J. A., aged 12 years, male, always in good health until December 1906. He was referred to me by Dr. Townsend of the Hospital for Ruptured and Crippled, with a history of having been kicked behind the right femur, just above the knee, three weeks before. He came home and complained of the injury to his mother who examined him and found no swelling. One week later he began to have pain in the region of the injury, and the mother again looked him over and discovered a hard, apparently bony swelling in this vicinity. Two weeks later he came to the hospital with a perfectly typical periosteal sarcoma, involving nearly 7 inches of the lower portion of the bone, entirely surrounding the shaft, extending nearly to the knee joint. It measured about 2¾ inches more than the other leg. Exploratory operation by Dr. Townsend showed it to be a round-celled periosteal sarcoma. The toxins were tried for two to three weeks with the hope of avoiding amputation, but while there was a decrease of 1¼ inches in the first ten days, thereafter the tumor increased in spite of larger doses, and amputation below the trochanter was performed and the patient put upon the toxins after recovery from the operation. (See later note.) Fig. 1.

The other case, M. B., aged 9 years, daughter of a prominent surgeon in the South, was brought to me on March 25, 1907, with a history that she had always been in good health up to two weeks before. Two or three weeks prior to this she had fallen from the bicycle, but no special injury was noticed at the time. On the 19th of March, she complained of trouble in her knee. Examination showed a tumor of apparently bony origin, just above the inner condyle, extending nearly around the entire bone. It grew very rapidly in size. Three days later, exploratory incision proved it to be mixed round- and spindle-celled sarcoma. When I saw her, six days from the time of the first discovery of the trouble, there was a tumor involving 5 inches of the shaft of the femur, measuring 2 inches larger in circumference than the opposite side. There had been no pain at any time. The toxins were advised before amputation and continued for about two weeks, with slight diminution at first, but at the end of the first week the tumor continued to increase in size in spite of the treatment being pushed to its limits. Amputation was then advised and performed and the patient put upon the toxins after recovery from the operation. (See later note.)

These two cases show the possibility of a periosteal sarcoma of large size developing within the short period of two to three weeks.

Fig. 2. Sarcoma of femur. Central Myeloid. Middle third.

Myositis ossificans, especially of the traumatic type, may closely simulate sarcoma of the long bones, as shown by the following recent history.

J. B. N., aged 19 years, male. F. H. good. P. H. Always well until November 17, 1906, when he was injured while playing football. He was struck violently against the right thigh by the shoulder of another player, while making "tackle." There was no external evidence of the injury seen that night, but the next day there was some swelling; two to three days later the leg became stiff, and the stiffness seemed to be confined to the region of the quadriceps muscle, greatly limiting the flexion at the knee. There was no pain at any time, but the swelling steadily increased in size. The patient at first believed the swelling to be in the muscle rather than the bone. The swelling slowly began to get hard and to contract. There was no loss of flesh or deterioration in the general condition. The patient was up and about all the time. He was examined by a number of prominent physicians, and all agreed as to the diagnosis of sarcoma, and amputation was advised. My opinion was asked by letter, and I replied that if the trouble was sarcoma, I would advise the preliminary use of the toxins before amputation. Thereupon the toxins were administered for about four weeks with little reaction and no apparent effect on the size of the tumor.

When I saw the patient, in April, 1907, he stated that the tumor had ceased to show any

Fig. 3.—Sarcoma of femur. Upper end.

increase in size prior to the time when the injections were begun. An X-ray photograph had been taken which showed a clearly outlined, apparently bony tumor situated in the middle and lower thirds of the anterior portion of the shaft of the left femur. There were certain peculiarities about the X-ray picture which made me suspicious that the condition was not sarcoma.

1. The swelling was confined almost entirely to the anterior aspect of the femur and showed no tendency to circumscribe the entire bone.

2. The tumor, though apparently reaching down to the periosteum, seemed not to involve the latter; at least, there was a perfectly definite, sharp outline to the periosteal border, absolutely no trace of any erosion.

3. The consistence of the tumor was extremely hard, much more so than is usually the case in periosteal sarcoma.

4. The tumor, although it had grown rapidly for the first two or three months, from that time on showed no tendency to increase in size; it remained practically the same, even before the toxins were begun. This points strongly against sarcoma, inasmuch as such tumors nearly always show constant and steady increase.

In view of these facts, I believed the condition to be one of myositis ossificans rather than sarcoma and advised an exploratory operation. Under ether anesthesia, I cut through skin, subcutaneous tissue and muscular fibres of the quadriceps and came down to a hard tumor, made up entirely of cancellous bone tissue, showing no structures at all similar to sarcoma. A portion of this bone was chiseled off, and careful examination by Dr. W. C. Clark, pathologist to the General Memorial Hospital, and Dr. Jas. Ewing, professor of pathology at Cornell Medical School, proved it non-malignant. They believed it to be myositis ossificans or myo-osteoma, one of the rare conditions which not infrequently occur in the quadriceps muscle following injury, and which have been so well described by Mr. Robert Jones, of Liverpool.

Much that has been said about the diagnosis of sarcoma of the long bones applies equally to sarcoma of bones in general. In different localities there are different symptoms or physical signs of special significance, e. g., in sarcoma of the pelvic bones, ilium or ischium, we often have as an early symptom severe and persistent sciatica or neuralgia of the anterior crural nerve which fails to yield to the ordinary methods of treatment.

More than half of my entire series of cases of sarcoma of the long bones occurred in the femur, i. e., 39 out of 72.

The ages of the patients ranged between 1½ and 58 years. Eighteen of the patients were females, 21 males.

Amputation at the hip joint was performed in 14 cases; high amputation in 10 cases. In the remainder no operation was performed, the disease being either too extensive, or the patients refused an operation, as was the case in 2 or 3 instances.

In 6 cases the mixed toxins were used after operation as a prophylactic against future recurrence.

The results in the 14 cases treated by hip-joint amputation were as follows:

Of 6 cases operated on by myself, all recovered from the operation, but the 5 that were traced all had local or general recurrence within a few months; 4 died within eight months and the fifth within one and one-half year. One patient was lost sight of at the end of three months. In the remainder in which the operation was done by other surgeons and which

came under my observation before or after operation, the results were as follows:

One, a girl aged 13 years, operated upon by Dr. Rushmore, remained well when last seen, five years after operation; 3 died within a year; the remaining 3 were not traced.

Thus, of the 14 cases treated by hip-joint amputation, only 1 was cured, and, without exception, the deaths all occurred within a year after amputation. There seemed to be little difference in the malignancy, whether the tumor was periosteal or myeloid.

Of the cases treated by high amputation below the trochanter, 10 in number, 1 died two years later. (He received toxin treatment for several months after amputation.) One died four months later of metastases in the lungs; a third died seven months after operation of metastases; a fourth died six months after operation.

In the remaining 6 cases the toxins were used in every instance after amputation as soon as practicable after wound healing. All of these cases remain well at the present time, 12, 11, 9, 8, 7 and $2\frac{1}{2}$ months after operation. Two patients gained from 26 to 40 lbs. while under the treatment, and at present there are no signs of recurrence in any case.[1]

Two other cases of sarcoma of the femur in which no operation was performed — in one of which the upper end of the femur was too extensively involved even for hip-joint amputation — must be given in some detail, as the results in these cases were largely responsible for my change of views as to the proper treatment of sarcoma of the long bones.

One of these cases was a round-celled (giant-celled) sarcoma, extensively involving the upper portion of the femur, in a girl of 19, in the service of Dr. Gerster at the Mt. Sinai Hospital. A portion of the tumor was removed by Dr. Gerster and pronounced giant-celled sarcoma by Dr. Mandlebaum, pathologist to the Mt. Sinai Hospital. In addition I sent a section to Dr. Prudden, of the College of Physicians and Surgeons, who pronounced it such a typical case of round-celled (giant-celled) sarcoma, that he said he would be glad to have a section for class demonstration.

The disease was so far advanced that spontaneous fracture occurred, and the patient was removed to the Montefiore Home for Incurables. The mixed toxins of erysipelas and bacillus prodigiosus were given for several months with the result that the tumor slowly disappeared. A sinus persisted for a considerable length of time, but the bone finally reunited, and the patient was presented by Dr. Rogers before the New York Surgical Society several years later. She was perfectly well when I last heard from her, about four years after treatment.

The second case was a male patient, 19 years of age, who had been referred to me by Dr. W. R. Townsend at the Hospital for Ruptured and Crippled, in February, 1902. He had a very extensive, round-celled sub-periosteal sarcoma of the femur, involving the lower two thirds. An exploratory incision was made and a portion of the tumor removed and examination made by Dr. E. K. Dunham, of Carnegie Laboratory, and B. H. Buxton, of Cornell University. Both pronounced it small round-celled sarcoma. Although I believed the prognosis to be practically hopeless from hip-joint amputation, I strongly urged the operation, but the patient and family absolutely refused their consent. I then put the patient upon the X-ray, in February, 1902. The treatment was continued with occasional intervals of rest during the entire spring and summer, with some slight diminution in the size of the tumor. In the fall of the same year he developed a very vascular metastatic tumor in the left pectoral region, the size of a hand. This was removed as far as was possible, though a good deal of tumor tissue was left behind. Very shortly it extended nearly to the umbilicus. The patient continued to lose in weight and strength and finally died of exhaustion October 10, 1907.

The other 2 cases, a boy aged 10 years and a girl of 9, in which a large periosteal round-celled sarcoma of the femur developed two or three weeks after an injury, the toxins were tried both before and after amputation with little benefit. Local recurrence and metastases developed in both cases two months after amputation and death occurred in both within four months after the inception of the disease.

The tumors in these cases represent the most malignant I have ever seen, and that the toxins were not successful in curing them was hardly a surprise. They were used before amputation in both instances, showing marked inhibitory action. This was, however, only temporary.

[1] Since the writing of the paper 4 of the cases above mentioned, well at the time, have shown a recurrence. One case in which there had been a gain of 40 lbs. under the toxin treatment after amputation, the patient began to have neuralgic pains in the sciatic region on the same side, about one year after amputation. A recurrence was suspected, but no tumor was observed until two months later, when an enlargement was discovered in the sacro-iliac region. The patient was re-admitted to the Hospital for Ruptured and Crippled and the toxins were resumed in large doses. There was at first slight diminution in pain, but no material improvement followed the treatment and at the end of two months it was discontinued. The patient failed very rapidly in strength. A hard, bony tumor soon appeared anteriorly, apparently springing from the ilium. This increased in size very rapidly until on September 23d,

Fig. 4. Sarcoma of tibia. Boy of 15 years.

Fig. 5. Sarcoma of radius. Periosteal.

afterward he developed a very large metastatic growth in his left ileolumbar region, fully the size of a child's head. Although I believed his condition hopeless, I put him upon the mixed toxins in large doses. After a few weeks the solid tumor began to soften and soon became fluctuating. I thereupon made a lumbar incision and evacuated between a pint and a quart of broken-down material. The cavity was drained for a long time, but finally healed. At the present time the patient is perfectly well; no trace of sarcoma can be detected, either in the femur or any other part of his body, more than five years since he came under my care, and nearly five years since the treatment was begun. The patient was presented before the New York Surgical Society in November, 1906, and on May 3, 1907, I showed him before the Surgical Section of the Academy of Medicine. (The X-rays were not used in the ileolumbar tumor.)

Sarcoma of the Tibia. With exception of the femur, the tibia is the most frequently affected of the long bones; the fibula much more rarely. The upper end of the bone is usually the site of origin.

In the tibia we are much more likely to find sarcoma of central than of periosteal origin, and the giant-celled type predominates. The disease is much less malignant than sarcoma of the femur, and its course is much slower. In sarcoma of central origin the bone may be gradually destroyed from within outwards until finally only a thin outer shell remains which, on pressure, gives rise to the characteristic eggshell-like crackling sensation. I have observed 14 cases of sarcoma of the tibia and 2 of the fibula. The ages of the patients ranged between 7 and 54 years. In 6 of the cases the tumor originated in the middle portion of the bone, in 4 each at the lower and upper ends.

Methods of Treatment. Amputation above the knee was performed in 6 cases, without mortality; amputation was advised, but refused by the patient in 6 cases; excision was practiced in 2 cases, the mixed toxins being used immediately after operation.

Results. In the 6 cases in which amputation above the knee was done, one, operated upon by myself ten years ago, still remains well; one, operated upon by Dr. McBurney in 1894,

Fig. 6. Sarcoma of tibia. Middle third.

Fig. 7. Sarcoma of humerus. R. Celled. Two months' duration.

died seven months later of metastases; another developed metastases in four months, one in six months; one was not traced; one giant-celled had pleural and lung metastases five and one-half years after amputation (Bull) with death six months later. Hence, of the 6 cases amputated above the knee, only one was permanently cured.

Of the remaining 8 cases, in one, a sarcoma of the middle third of the tibia, recurrent after operation, I decided to use the mixed toxins before sacrificing the limb. The toxins were begun in February, 1899, and continued for two to three months, with the result that the tumor entirely disappeared, and the patient is still in good health, working upon his farm in Chesley, Ont., eight years afterward. Microscopical examination in this case was made by Dr. John Caven, Professor of Pathology at the University of Toronto, Canada, who pronounced it spindle-celled sarcoma.

In another case, a sarcoma of the lower end of the tibia, two operations of partial excision were performed by Dr. Gibney, immediately followed by the injections of the mixed toxins. Recurrence took place also after the second operation. The injections were kept up for more than six months, during the latter part in conjunction with the X-ray. The tumor finally disappeared, and the patient is well and free from recurrence at the present time, nearly three years later. I saw her two days ago The other cases in which operation was refused have not been traced.

Sarcoma of the Radius and Ulna. Five cases, 3 of the radius and 2 of the ulna.

One case, a sarcoma of the ulna, in which amputation was performed in 1898, by Dr. Geo. Tully Vaughan, for a round-celled sarcoma of the ulna, following a "greenstick" fracture, recurred eight years afterwards in the abdomen.

The patient was referred to me by Dr. J. W. Perkins of Kansas City, in October, 1906, with a very extensive recurrence, the whole abdomen being filled up with a solid mass, presenting the appearance of the abdomen of a woman eight months pregnant. There was no ascites. The patient was immediately put upon the toxins which were given in the pectoral region. There was prompt and rapid improvement which has continued up to the present time. The masses in the abdomen have diminished; they are now not more than one third of their original size, and the patient's general health is much improved. This patient was shown before the meeting of the American Orthopedic Association, May 8, 1907.

Sarcoma of the Humerus. Sarcoma of the humerus is very rare and exceedingly malignant. The upper end of the bone is most frequently involved, but the whole shaft is quickly invaded; the surrounding tissues are infiltrated. In a case which was personally observed and in which I performed amputation at the shoulder joint, half the clavicle was involved and most of the scapula. The disease quickly recurred in the portion of the clavicle remaining, with metastases in the spine. In sarcoma of the humerus, there seems to be a special proneness to recur in the opposite humerus; this has been noted in 2 cases personally observed.

While diagnosis ought to be possible in the early stages, a study of the reported cases will show that early diagnosis is seldom made. In 2 cases the patients were treated for rheumatism until the tumors were about the size of a cocoanut. The rapidity of the growth was undoubtedly enhanced in the one case by the electric vibrator treatment, and in the other by vigorous application of osteopathy. In neither case had there been any history of previous rheumatism.

Fig. 9. Sarcoma of humerus. Round celled. Periosteal.

Fig. 8. Sarcoma of humerus. 6 months' duration. Periosteal. Round celled. Right half of photo shows sarcomatous thrombi, in both subclavian artery and vein.

The sudden discovery of a hard, painless swelling in the humerus, especially in its upper portion, with or without previous injury, in an apparently perfectly healthy individual, should arouse strong suspicion of the presence of sarcoma. Almost the only condition likely to be mistaken for it would be a chondroma, which is much rarer and of very much slower growth. The following case illustrates well the history of the sarcoma of the humerus.

Sarcoma of the Humerus. G. W., female, 16 years of age; Stamford, Conn. F. H. Negative. P. H. No injury. In the latter part of January, 1907, the patient first noticed a dull aching pain in the right shoulder, which was worse at night. A few weeks later, a swelling appeared which grew in size very rapidly. She then consulted Dr. Gibney at the Vanderbilt Clinic in the early part of June, 1907. An X-ray photograph was taken which confirmed the clinical diagnosis of sarcoma of the humerus. The patient was referred to me by Dr. Gibney and admitted to the General Memorial Hospital on June 14, 1907. General condition was perfect. Physical examination at this time showed the upper end of the humerus occupied by a large tumor, largest circumference at the upper extremity of the humerus, globular in shape, gradually tapering downwards, its lower portion being simply a fusiform enlargement of the shaft of the humerus. Figs. 8 and 9.

Measurements: Right axilla, passing over the acromion process of the clavicle, 15 inches; left axilla, passing over the acromion process of the clavicle, 14 inches; 3 inches further down showed 13 inches on the right, 9¾ inches on the left side; 6 inches down showed 10¼ inches on the right, 8½ inches on the left side.

A preliminary trial with the toxins was given for four weeks, the patient receiving 23 injections in all. At first there was slight diminution in the size of the growth, but later the tumor began to increase again. The injections were given partly into the tumor itself, partly into the pectoral region, and a temperature as high as 105° was obtained. At the end of two weeks' treatment operation was advised, but the family would not consent until two weeks later, when intrascapular thoracic amputation with resection of the clavicle and preliminary ligation of the subclavian artery and vein was performed. The glands were found extensively involved. On cutting through the vessels, the lumina of both artery and vein were found obliterated and occupied by large thrombi of sarcomatous material. The nerves were injected with a one-tenth per cent solution of cocaine, before they were cut. There was very little loss of blood and practically no shock, and the patient made an uninterrupted recovery.

October 2, 1907: The patient's general condition seems perfect; she has gained considerably in weight. There is, however, evidence of a local recurrence just below the clavicle and in the upper part of the right breast. The mixed toxins were resumed on October 10th. November 8, 1907, the evidences of recurrence have disappeared. December 24, 1907, the patient has gained 4 pounds under treatment, and is still free from any signs of pecundate.

The growth in sarcoma of the humerus is so rapid that one can see its increase in size from day to day. In the cases that I have observed, 15 in number, pain has been a fairly early sign, but has not been severe until the tumor has reached considerable size. The tumor originated in the upper end of the bone in all cases except 1, in which it started in the middle. The pain was never marked, except in the later stages of the disease. Sarcoma of the humerus shows a greater tendency to infiltrate the neighboring tissues, both bone and soft parts, than sarcoma in any other locality. The axillary glands are not infrequently involved, and the scapula and clavicle are early invaded by the disease. The almost hopeless prognosis in these cases is shown by the collections of Barling and Dent.

Of the 14 patients in my series, 6 were females, 8 males, and their ages ranged between twenty months and fifty-eight years; 6 were under twenty years of age and only 3 over thirty years. Antecedent injury was noted in 4 of the 14 cases. In 10 of the cases the tumor had been observed less than six months; in 3 cases from one to three months.

Methods of Treatment. In 4 cases amputation was refused, though strongly urged. Amputation at the shoulder joint was performed in 6 cases, with 1 death from shock. (In this case the tumor was very large. I saw the patient in consultation and advised operation, but it was performed by another surgeon.) Resection was performed in 3 cases.

In the 6 cases in which shoulder-joint amputation was done, 1 died of the operation and the remaining 5 all died within four to ten months. Of the 3 in which excision was performed 2 were lost sight of. The third is the case of Dr. Blake, of Boston, which I have already reported at length in a former paper. The head of the bone was excised, but the disease now involved both the clavicle and scopula. Amputation of the entire upper extremity with clavicle and scopula was advised but refused. The patient was immediately put upon the toxins with completed recovery; she is now well, more than nine years after.

She was shown by Dr. Blake at a meeting of the Suffolk County Medical Society, November 14, 1907, in perfect health more than nine years later. She had perfect use of her arm.

In 4 cases the mixed toxins were used after operation, twice after amputation, once after excision. The 3 cases in which the toxins were used after amputation were treated by myself, and in two cases the toxins failed to check the return of the disease or to prevent a fatal issue. A third case is still under treatment. Yet, the fact that the only cure in the entire series of 15 cases (Blake's) was undoubtedly due to the toxins, is sufficient to justify the use of the toxins after operation.

Final Results in Sarcoma of the Long Bones. Ten patients have remained well over three years. One patient with sarcoma of the femur was well five years after hip-joint amputation; another was well after five years, no operation, medicinal treatment,—diagnosis in this case was probably erroneous; 1, a subperiosteal round-celled sarcoma of the femur with metastases, well after five years, treated with the toxins, without operation; 1 of the

tibia remains well eight years after treatment with the mixed toxins, without operation; 1 of the tibia, well ten years following amputation of the thigh; 1 of the tibia, well five and a half years after, then developed metastases in the lung; 1 of the tibia, well two years after, recurrent twice after conservative operation, the tumor disappeared under the toxins and X-rays, patient well at present; 1 of the humerus, well after nine years after resection, followed by the mixed toxins; 1 of the radius, well six years after resection; 1 of the ulna, well eight years, then developed extensive abdominal metastases; 1 of metatarsal bone, well five years, amputation of leg, middle and lower third, mixed toxins after operation, four months.

The prognosis of sarcoma of the long bones in general I have discussed fully in a recent paper (loc. cit.).

Prognosis of Sarcoma of the Short Bones, e. g., metacarpal and metatarsal bones, clavicle, is exceedingly grave. Fortunately, sarcoma in these bones is extremely rare. I have seen only 2 cases of sarcoma of the metacarpal, 1 of the metatarsal, and 7 of the clavicle.

One of my cases of sarcoma of the metacarpal bone was not traced. In the other case the tumor developed immediately following a blow upon the hand. I saw the case about four months after the injury. An exploratory excision was made and microscopical examination proved the growth to be an alveolar round-celled sarcoma. Immediate amputation of the forearm was done. In four weeks there was multiple recurrence in both breasts, quickly followed by general metastases in the liver and abdomen, with death in six weeks.

In the one case of sarcoma of the metatarsal bone I have had, the tumor grew with almost equal rapidity. In this case I performed amputation in the middle of the leg, immediately placing the patient upon the injections with the mixed toxins, which were continued for nearly six weeks. The patient is at present still well, more than five years later.

In one of my cases of sarcoma of the clavicle, the tumor developed with tremendous rapidity, causing death in about four weeks. I have never seen a case of sarcoma of the clavicle recover.

Sarcoma of the Large Bones, e. g., ilium, ischium, or any of the pelvic bones, after operation, is very grave. The disease can rarely be fully removed, and speedy recurrence is the rule. I have had one case of very large inoperable sarcoma of the ilium, apparently cured by the mixed toxins.

Fig. 10. Sarcoma of lower jaw. Local recurrence ten years after excision.

The Prognosis of Sarcoma of the Phalanges of the Fingers, or short bones, is much better than in sarcoma of the metacarpal bones. Immediate amputation has been the rule, as soon as the diagnosis has been made. One of my own cases, a periosteal sarcoma of the ring finger, in which the diagnosis was confirmed by Dr. W. H. Welch, of Johns Hopkins, and Dr. B. H. Buxton, of Cornell, and a number of other pathologists, the patient was unwilling to consent to an amputation. She was immediately placed upon the mixed toxins, and the treatment continued with intervals for upwards of six months. She is now in perfect health, without any signs of a recurrence, more than eight years later. Two cases of sarcoma of this jaw have been apparently cured by the toxins. One case an inoperable round-celled sarcoma of the upper jaw with probable abdominal metastases (microscopical examination by Dr. William H. Welch), entire recovery and patient well six years later. This case was treated by another physician under my direction (see N. Y. Med. Record, May 3, 1902). A second case of spindle-celled sarcoma of lower jaw treated by myself. Entire disappearance, and patient well December, 1907, 1 year.

Fig. 11.—Sarcoma of ilium.

Sarcoma of the Spine. I have observed six cases. One case, starting in the middorsal spinous process, of the spindle-celled type, disappeared under the toxins and was well when I last saw her, nearly ten years after recovery.

Another case, involving at least 4–5 bodies of the vertebra, is of very great interest.

Round-celled Sarcoma of Dorsal Spine. Mr. G., aged 20 years. Diagnosis confirmed by Dr. Harlow Brooks, pathologist of the Bellevue Hospital. The tumor was of enormous size, involving the lower dorsal and upper lumbar vertebræ. The patient had lost about fifty pounds in weight, and there was so much pressure upon the spinal cord that there was total paralysis of the lower extremities, bladder, and rectum, and he was so weak that he was unable to turn over in bed. Seen in consultation with Dr. V. P. Gibney, of the Montefiore Home, in February, 1902. The mixed toxins of erysipelas and bacillus prodigiosus were begun and continued by the house staff under my direction; daily injections were given up to the following May, and severe reactions, temperature of 103° to 104°, followed most of the injections. Patient began to show improvement, local as well as general, almost at once. By September he was able to get out on crutches. In November he was shown before the New York Surgical Society. At that time he had regained nearly his normal weight and got about very well with the aid of a cane. In February, 1903, one year after treatment, he was able to walk perfectly well without support of any kind, and his general health had become perfect. He was able to resume his former occupation.

This I believe to be the most remarkable result ever obtained from the use of the toxins. Fortunately, there can be no doubt as to the diagnosis, since the tumor was not only examined by well-known pathologists, but specimens of the tumor have been preserved. I have shown this patient before various medical societies the past two years. He remains in perfect health, five years after treatment, and he was presented before the New York Academy of Medicine May 13, 1907.

Treatment. What are the modern methods of treatment of sarcoma of the bone? First, with reference to sarcoma of the long bones: The almost universal rule among the best surgeons of the world is immediate amputation of the limb, usually a disarticulation at the proximal joint. A few surgeons will be found, following the lead of Mikulicz, who will advise

Fig. 12.—Sarcoma of humerus in child 18 months old.

complete or partial resection instead of amputation in cases of sarcoma of the myeloid type, especially of the tibia or radius. The usual unfortunate end of amputations I have already attempted to show. In the periosteal type of sarcoma of the long bones, especially the femur and humerus, not only is the limb sacrificed, but in the great majority of the cases there is failure to save the life of the patient.

The gloomy prognosis of sarcoma of the long bones, even in face of such radical operations as amputation or exarticulation at the proximal joint, is still further emphasized by Butlin who, in a series of 68 cases of sub-periosteal sarcoma of the femur collected mostly from English and German clinics, reports only 1 case that remained well beyond three years, and in this case there was some reason to believe that the disease was of central rather than periosteal origin. Of 46 cases of sarcoma of the femur, of the myeloid type, collected by Butlin, 5 remained well beyond three years. In the cases of sarcoma of the tibia and fibula, the results were little better. Of 35 cases of the sub-periosteal type, only 1 remained well beyond two years, while of 52 cases of the myeloid type, 9 were well beyond three years. Butlin was able to collect only 18 cases of sarcoma of the humerus of the periosteal type that had recovered from operation. Of these only 1 was known to have been well beyond three years; of 10 of the myelogenous type, 2 were well beyond three years.

Butlin concludes: "We cannot but form the opinion that the disease (periosteal sarcoma of the humerus) is horribly and rapidly fatal and that the prospect of complete cure, or even long immunity from recurrence, is singularly small." Of the sub-periosteal sarcomas of the femur, he states: "The cases which were followed up by Mr. Colby and myself were almost invariably fatal, and in the large majority of them death occurred within a few months of the amputation. In many of the cases amputation was performed within three months of the first observation of the disease; in some of them within a few weeks. From every point of view, I cannot but regard sub-periosteal sarcoma of the femur as a remarkably deadly disease, and I am not yet clear that surgery can do more than palliate the distress occasioned by it, and that only in a comparatively few cases. The only hope of the future is in very early diagnosis and in very high amputation."

In sarcoma of central origin the lives of a certain number of patients are saved by operation, but the limb is sacrificed. In a still smaller number of cases of the myeloid type both leg and life are saved by resection.

Such, in brief, are the results of modern methods of treatment of sarcoma of the long bones, and they form one of the most gloomy chapters in the history of modern surgery.

In a recent paper on Sarcoma of the Long Bones (Annals of Surgery, March, 1907) I advocated a new departure in the treatment of sarcoma of the long bones. Up to a comparatively recent period, I had been one of the staunchest advocates of early and high amputation for these conditions. I was led to change my opinion for two reasons:

1. The almost complete failure to save the patient's life after the sacrifice of the limb; especially in sarcoma of periosteal origin.

2. The fact that in a number of apparently most hopeless cases in which amputation was refused, or considered impossible, the tumors had disappeared under the treatment with the mixed toxins, with the result that the limb as well as the life was saved.

In my opinion, a sufficiently large number of such results have been obtained, by others as well as myself, to warrant one in advocating as a routine procedure, in cases of sarcoma of the long bones, the preliminary use of the mixed toxins before sacrificing the limb. The same would apply to sarcoma of the lower jaw. I have had one case in which the preliminary use of the toxins rendered excision unnecessary. There are now on record 13 cases of sarcoma, in which the limb as well as the life of the patient has been saved by the use of the toxins. Of these 8 are well from four to nine years.

In a certain, and probably large proportion of cases, especially those of periosteal sarcoma of the femur and humerus, in which the growth is extremely rapid, the toxins will probably fail to check the progress of the disease. This can be determined in a very short time, say two to three weeks. If the tumor is not brought under definite control within this time, I would advise immediate amputation, followed by the

prolonged use of the toxins as soon as possible after recovery from the operation. In cases of myeloid sarcoma I believe that resection should be the operation of choice. The toxins to be used in these cases also, as soon as the patient has recovered from the operation. The cases of sarcoma of the femur already cited, in which the toxins were used after operation, together with upwards of 20 cases in which the toxins have been used after primary operation of sarcoma of the soft parts, have been followed by such an insignificant proportion of recurrences, as to practically establish the value of the treatment as a prophylactic measure.

The use of the mixed toxins of erysipelas and bacillus prodigiosus for sarcoma is no longer in its experimental stage, as I have attempted to show in my article in the American Journal of the Medical Sciences, March, 1906. This paper contains a report of 36 cases of inoperable sarcoma in which the toxins had been used with success during the last fourteen years.

Twenty-six of these cases were well and free from recurrence from 3 to 13 years.

Twenty-one of these cases were well and free from recurrence from 5 to 13 years.

The same paper contains a tabulated report of 60 cases of inoperable sarcoma successfully treated by other surgeons, of which 27 are alive and well from 3 to 12 years. Of these 22 were round-celled sarcoma, 14 spindle-celled, 3 mixed-celled, 3 endothelioma; in 16 no microscopical examination was made. This is sufficient refutation, I think, of the statement occasionally made, that the method has been successful only in the hands of its author.

Since the publication of this paper I have had 8 other successful cases, making a total of 44. Of these 17 were round-celled sarcoma, 17 spindle-celled sarcoma, 2 mixed-celled, 1 chondrosarcoma, 1 epithelioma. In the remaining 5 no microscopical examination was made, but the clinical features of the cases were such as to leave hardly any doubt as to the malignancy of the disease.

With regard to the late results of these cases:

Twenty-one were alive and well from 5 to 15 years.

Twenty-seven were alive and well from 3 to 15 years.

Ten were alive and well from 10 to 15 years.

These clinical results have recently been supplemented by the experiments of Dr. Martha Tracy[1] and Dr. S. P. Bube, of the Huntington Cancer Research Fund, at the Loomis Laboratory. The mixed toxins of erysipelas and bacillus prodigiosus injected systematically into dogs with multiple sarcoma, caused entire disappearance of the tumors within a few weeks. Dr. Tracy also demonstrated that the toxins of the bacillus prodigiosus produced the same results, though less rapidly than the combined toxins, thus proving my previously expressed belief that the prodigiosus had an inherent value of its own aside from its power to increase the virulence of the streptococcus when grown together.

In view of Dr. Tracy's experimental demonstration of the important and independent part played by the bacillus prodigiosus in the curative process it occurred to her that the way to standardize the preparation and make it possible to estimate more accurately its strength and dosage, would be, to grow the two organisms separately, reduce the bacillus prodigiosus to a dry powder, add so many milligrams by weight per cubic centimeter to the sterilized streptococcus broth. Her process in detail is as follows:

Streptococcus culture in broth — three weeks' growth, 100 c.c.

Prodigiosus suspension, containing 750 milligrams of prodigiosus proteid, 30 c.c.

Glycerin, 20 c.c.

Each cubic centimeter of the mixture then contains 5 milligrams of the prodigiosus proteid. Considering 1 oz. to be equal to 29.57 c.c., it contains 147.85 milligrams prodigiosus proteid; 1 c.c. equals about 17 minims, so 1 minim contains about 3 milligrams of prodigiosus.

The prodigiosus suspension used is made and measured in the following way: Prodigiosus is grown on agar for ten days. There is then a thick red growth, which is scraped off with glass rods and rubbed up with a mortar and pestle to a smooth, rather thick suspension, using physiological salt solution as diluent. This suspension is sterilized by heat — one

[1] The results of Dr. Tracy's experiments were reported before the Sec- [illegible] October, 1907.

hour at 75°. The total nitrogen per c.c. is determined, and the weight of nitrogen per c.c. multiplied by the factor 6.25 gives the weight of proteid present. Thus the weight of prodigiosus proteid in each c.c. is known, and the suspension is diluted to the required strength before mixing with the streptococcus culture. After mixing and bottling the toxins, the mixture is again sterilized two hours at 75°.

The toxins made in this way I have used almost exclusively during the past six months, and I believe that they are not only more powerful than the earlier preparations, but more efficient.[1]

A word of warning should be said in regard to the dangers attending the use of such a powerful preparation as the mixed toxins. If proper precautions are observed, I believe the toxins may be used with almost perfect safety. In about 400 cases in which I have used the mixed toxins during the last fifteen years there have been only 3 cases in which death could, possibly, be attributed to the injections. All 3 of these cases were in the last stages of the disease, suffering from extensive metastases, associated with very feeble heart action. Two of the cases presented extensive involvement of the mediastinal glands. In both of these cases the treatment had only just been begun for two or three days and sufficient doses had not been given to produce any marked reaction. The patients died suddenly, apparently as a result of an embolus.

It is most important to begin in every case with a very small dose, not over ¼ minim (diluted with a little boiled water to insure accuracy of dosage). If the tumor in question is highly vascular, it is wiser to begin the injections remote from the same, until the susceptibility of the patient to the toxins has been ascertained. This varies considerably in different individuals. After a few doses it is safe, in most cases, to inject into the tumor itself.

As a rule, when giving injections into the tumor, only about one fifth of the dose used for injections remote from the tumor is required to produce the same reaction. The dose should be increased by ¼ minim when given into the tumor; by ½ minim when injected remote from the tumor, until the desired reaction is obtained. The best results are obtained by doses sufficiently large to produce severe reactions, say a temperature of 102° to 105°.

The frequency of the injections must depend entirely upon the strength of the patient, some being able to bear daily injections, while in others it may be unwise to push the treatment beyond three or four injections a week.

In the successful cases the effect is usually very promptly noticeable. The tumor becomes smaller in size, much more movable, and very much less vascular. These changes appear very quickly, often within two to three days.

The action of the toxins is both local and systemic. Sometimes the best results are obtained by giving the injections alternately into the tumor and remote from the same. In tumors in inaccessible regions, e. g., intra-abdominal sarcoma, or sarcoma of the tonsil, a perfect cure may be obtained entirely by systemic injections. Care must be taken not to give sufficiently large doses to break down the tumor more rapidly than it can be absorbed, especially in case of intraabdominal sarcoma.

When used after operation as a prophylactic against recurrence, smaller doses will suffice, and the treatment need not interfere with the regular routine of life.

In conclusion, I desire to express my sincere thanks to Dr. Virgil P. Gibney as well as to Dr. Wisner R. Townsend and Dr. Royal Whitman for a generously placing at my disposal the large number of cases of bone sarcoma occurring in their clinic at the Hospital for Ruptured and Crippled during recent years.

For bibliography, Vide "Sarcoma of the Long Bones," Coley. — *Annals of Surgery*, March, 1907.

[1] Parke, Davis & Co. are making the toxins according to the method described above, and they are putting forth every effort to obtain the preparation up to the standard obtained by Dr. Tracy.

THE GENERAL PRINCIPLES OF ABDOMINAL SURGERY

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WHENEVER we can think in terms of accepted general principles, it is always wise to do so. We are spared confusion and bewilderment of thought, and enabled at the same time to connect and to retain scattered items of knowledge which are liable, for want of such connection, to miss their true significance and to slip rapidly from the memory. The general principles of surgery apply to every part of the body, but there are certain points to which attention may be usefully drawn when the abdomen is under special consideration. Here, as elsewhere, inflammation has for its recognised cause infection by organisms.

Acute inflammation is due to pyogenic organisms, and in the abdomen the chief of these is the bacillus coli.

Chronic inflammation is traceable to the activity of the organisms of tubercle and syphilis.

The terminations of acute inflammation in the abdomen as elsewhere are:

1. Resolution.
2. Fibrosis.
3. Partial destruction.
4. Total destruction.

This knowledge applied to a consideration of conditions met with in the abdomen prevents confusion and renders some otherwise obscure problems comparatively easy of solution. Applied, for example, to three diseases much discussed at the present time, viz., appendicitis, cholecystitis, and pancreatitis, it shows how the pathological conditions prevailing agree with what would be expected on general principles; it explains how the appendix, the gall-bladder and the pancreas may each become fibrosed; how each may ulcerate or suppurate and slough; and how under the most serious conditions gangrene may represent the final stage of each of these diseases.

With regard to chronic inflammation—which in the abdomen is nearly always due to

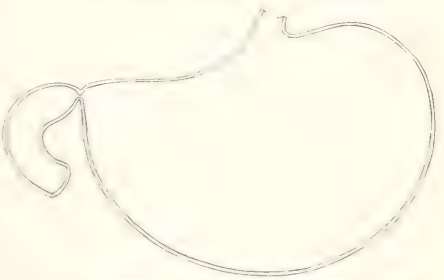

Fig. 2. Stomach, with stricture of pylorus. Large cavity. Thin walls.

Fig. 1. Stomach, with stricture of pylorus. Small cavity. Thick walls.

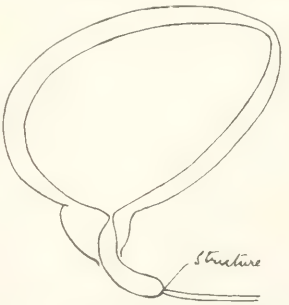

Fig. 3. Bladder, with stricture of urethra. Small cavity. Thick walls.

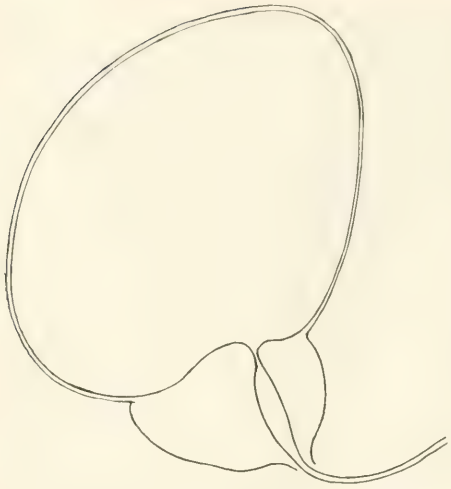

Fig. 4. Bladder, with enlarged prostate. Large cavity. Thin walls.

tubercle— the same rule of thought applies, for the difficulties which confront the surgeon are usually those which he is accustomed to associate with the presence of tubercle elsewhere. There is the same tendency to infect lymphatic glands and soften and break them down, the same slow obstinate ulceration, the same natural cure by fibrosis, the same clinical tendency to mislead in diagnosis by the occasional mimicry of malignant growths and ulcers, and the same need for remembering the specific underlying disease as a frequent cause of obscure or indefinite tumours or fluid effusions.

CALCULI

Much discussion has arisen lately as to the cause of calculi. All recent writers suggest microörganisms as the cause of such of them as are produced in sites communicating with the alimentary canal, and judging from what has been observed elsewhere the explanation is probably a correct one in some cases. Phosphatic calculi are of frequent occurrence in septic bladders and kidneys, and the septic bacteria present are most probably responsible. On the other hand, it is clear that no theory on the subject can be regarded as entirely satis-

Fig. 5. Gall-bladder, with common duct stone *not* large enough to fill distended common duct. (Partial obstruction.) Small cavity. Thick walls.

Fig. 6. Gall bladder, with enlarged head of pancreas and distended common duct. Large cavity. Thin walls. (Complete obstruction.)

Fig. 7. Caecum and colon, with stricture of sigmoid. Small cavity. Thick walls. (Partial obstruction.)

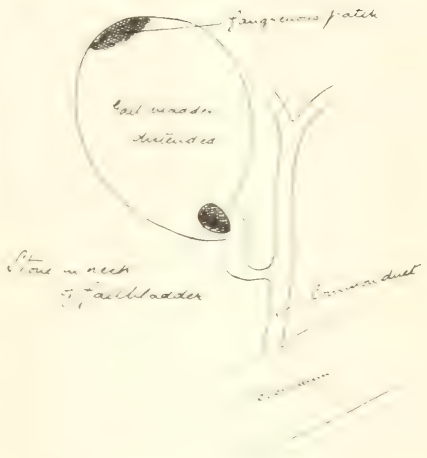

Fig. 9. From acute gall-stone attack of four days' duration.

Fig. 8. Caecum and colon, with tight stricture of sigmoid. Large cavity. Thin walls. (Complete obstruction.)

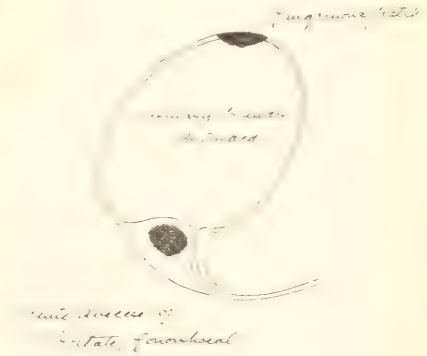

Fig. 10. The gangrene followed three days of complete obstruction.

Fig. 11. From an acute appendicitis of twenty-four hours' duration.

factory which does not explain the occurrence of calculi in every situation in which they appear, and under all the circumstances of their production. It is more probable that salivary, cerebral, biliary, vascular, intestinal, urinary and other calculi all own the same general cause, and that it remains as yet unknown.

A fashionable disease known as "mucous colitis" is not uncommon. A few of its victims have such a tendency to form grit that they pass it from the bowel in large quantities as intestinal sand. The capacity of some persons for the formation of urinary gravel has to be seen, in order to be believed. To explain these cases by the microbic theory would postulate the exercise of such prodigious microörganic activity as to be inconceivable, in view of the local and general conditions of health observable in patients at the time. From a practical standpoint calculi are to be regarded as foreign bodies, for they behave as such. Like foreign bodies, when undisturbed and quietly resting, they cause no serious trouble and but few symptoms. Like foreign bodies they weaken the normal resistance of the surrounding tissues and predispose to infection. As in the case of foreign bodies, when once infection has occurred it is difficult to get rid of, until the calculus has been removed or extruded. No one possessing a knowledge of these facts could be surprised to learn either that biliary, renal, salivary, bladder, or intestinal calculi may be present without symptoms, or that once infection has occurred in connection with any of them serious troubles are likely to follow.

But the results dependent on the presence of calculi in the abdomen cannot be understood, unless the conduct of the hollow viscera in which they are contained is fully appreciated. All of these viscera possess the power of contraction, by virtue of the unstriated muscle in their walls.

The ordinary contractions of unstriated muscle are not perceived; they are painless. The forcible contractions of unstriated muscle are well-nigh unendurable; they cause the most severe pain that human beings can experience. All the colics are pathological examples of this fact, labour is a physiological analogue.

The most usual stimuli to forcible contraction are the presence of a foreign body plus inflammation, or rapidly increased tension. An excess of carbonic acid, such as accumulates in the blood during sleep, is a predisposing cause of active contraction in unstriated muscle; hence the frequency with which colic awakens the patient in the early hours of the night when sleep is deepest. Exhaustion of the muscular

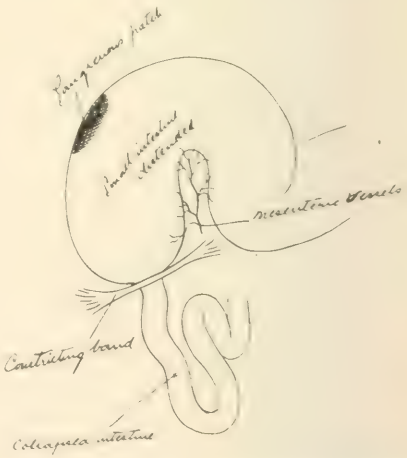

Fig. 12. From a case of acute intestinal obstruction of two days' duration.

walls follows prolonged and intense effort, and relief from the severe pain results, even though its cause be not removed. Instances of this in the urinary and gall bladders, the intestine, the ureter, the bile ducts, and the pregnant uterus, are not rare.

All the hollow viscera react in a similar manner to stimuli. If the obstacle to be overcome is partial obstruction, their walls thicken from hypertrophy and their cavities diminish. If the obstacle prove invincible, the muscular walls cease to contract, the violent pains abate, paresis of the muscular coat occurs and is followed by passive distension of the viscus and degeneration of the unstriated muscle. Painless urinary retention with overflow is thus explained; so are hydrops of a gall-bladder distended by its own secretion, and the large gall-bladder dependent on a complete and chronic obstruction of the common duct; so are painless distension of the caecum following on a block of the sigmoid flexure; the enormous painless distension of the stomach resulting from obstructed pylorus; hydrosalpinx following occlusion of the Fallopian tube and hydrops of the vermiform appendix.

If active inflammation is superadded to obstruction, the intravisceral tension may become so acute that partial or total gangrene of the involved viscus, to be followed by its rupture, will take place. It is a very general belief at present that gangrene of the abdominal and pelvic viscera is the direct result of infection by specially virulent organisms. That some rare forms of gangrene are due to this cause is undoubted, but in these regions, as in others, we believe that gangrene is in general directly due to a mechanical interference with the circulation in the nutrient blood-vessels of the parts concerned, and that infection and inflammation, by causing intravisceral tension, are often exciting causes of the circulatory disturbance. We think that evidence of this is forthcoming in the fact that gangrene commences at a site furthest from the vascular supply. We have had opportunities for observing that in the gall-bladder a gangrenous patch is observed first at the fundus; in the urinary bladder at the superior portion of the posterior wall; in the appendix and small intestine at a point opposite the mesentery; in the caecum in the neighbourhood of its anterior longitudinal band; and that in each instance it appears as a rounded or oval patch, so placed as to be furthest from the vascular supply of the viscus involved.

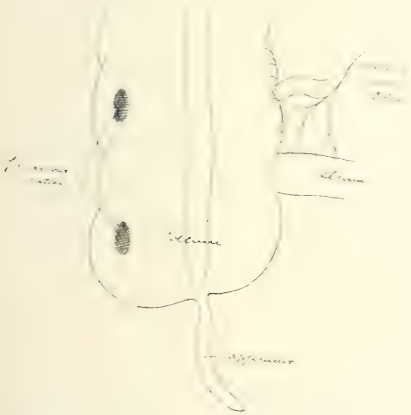

Fig. 13. From a case of stricture (malignant) of the sigmoid flexure, causing complete obstruction of two weeks' duration.

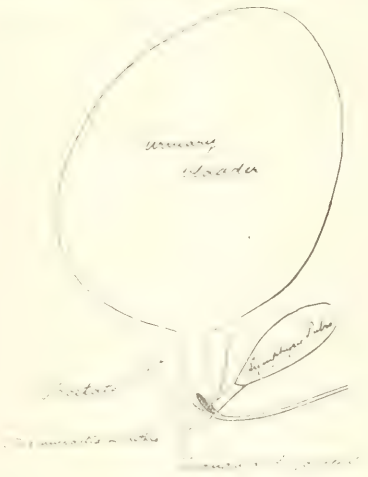

Fig. 14. A stone of this size will cause complete obstruction. (Drawing reduced one-half.)

Another fact which should be remembered is that muscular tubes, such as the intestine, urethra, bile duct, and ureter, may all behave in the same way when a foreign body attempts to pass through them. A relatively small body, such as a stone of moderate size, may set up violent spasmodic contraction and be so tightly gripped as to cause, temporarily, complete obstruction. At a later stage the walls of the muscular tube recede from the foreign body, and active dilatation follows. The temporary attacks of intestinal obstruction, caused by the passage of a gall-stone through the intestine, may be thus explained; so may intermittent hydronephrosis from a stone in the ureter; and intermittent jaundice from a stone in the common bile duct.

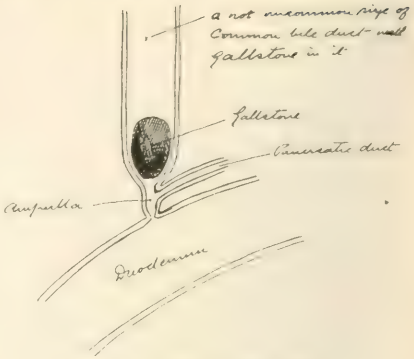

Fig. 16. Drawing reduced one-half.

SACCULI

The importance of grouping together similar structures, in order to understand pathological possibilities, is well demonstrated by the discovery of sacculi. Sacculation of the urinary bladder is well known. Similar changes have

Fig. 15. Size of gall-stone which caused jaundice and death by occluding the common bile-duct. The gall-bladder and common duct had been cleared (?) by operation two weeks previously, and this stone only was found post-morten. The patient whilst convalescent was seized with a severe attack of biliary colic. Next day was jaundiced, and died suddenly syncopal three days later.

been found in the intestines, especially of the colon, in the gall-bladder, the vermiform appendix, and Fallopian tubes, indeed it is safe to say that they will be found, if sought for, in any of the hollow muscular-coated viscera. The exact pathology in all is obscure, but they all, excepting the congenital types, probably have as in the urinary bladder some relation to inflammation of the walls and obstruction of the outlet.

SOME FUNCTIONS OF THE OMENTUM

A special protective agency exists in the abdomen but for which many abdominal diseases and operations would be attended by a much higher mortality than they are. The omentum, in addition to other uses, may be regarded as the "abdominal policeman." It travels about in the abdomen with considerable activity and is attracted by some sort of information to neighbourhoods in which mischief is brewing It may effect a radical cure of hernia by blocking the hernial orifice with an omental plug. It surrounds and adheres to a recently reduced strangulated and damaged loop of intestine, and may keep it alive and prevent a leak. It is generally found in the neighborhood of a diseased or inflamed appendix, and by wrapping it up, if gangrenous, or by locking up the pus from an appendix abscess, may prevent general peritonitis. In a similar manner it may prevent the perforation of an ulcerating malignant growth, or of a gastric ulcer, or the death of a damaged portion of bowel, or the perforation of a suppurating gall-bladder. When it is found covering and closely enveloping an ovarian cyst or a fibroid tumour of the uterus, even though not adherent, it is safe to assume that something wrong will be found in the tumour. Its effective mobility is shown by the fact that whether the lesion be in the

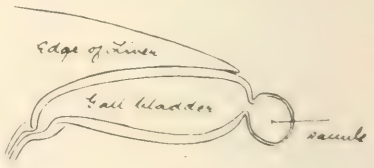

Fig. 17.

Fig. 18.

diaphragmatic roof of the abdomen, or on the floor of the pelvis, there the omentum can and does find its way.

TORSIONS

Twists are common to nearly all of the abdominal viscera. The intestine (volvulus), stomach, gall-bladder, appendix, kidney, spleen, omentum, ovaries, Fallopian tubes, uterus (pregnant and fibroid), and testes are each liable to such accident.

The sudden attack, the mystery of its onset, the associated dangers and pain, and the amenability of the condition to surgical treatment have made this subject one of special interest.

Whatever organ the twist involves, and whether viewed in reference to etiology, pathology, symptoms, diagnosis, prognosis, or treatment, all cases have many points in common.

Fig. 19.

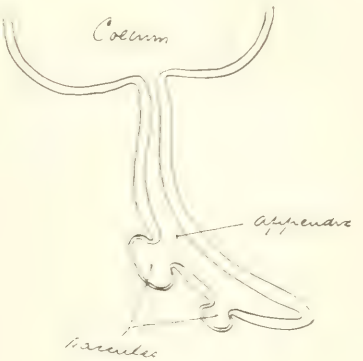

Fig. 20.

In order to twist, the organ must have a pedicle, congenital or acquired, and the longer the better. It must have space to turn in and a shape which will allow of rotation. No other movable body answers to these requirements as does an ovarian tumour, and so accordingly the majority of torsions are associated with ovarian tumours.

The presence of a second ovarian tumour or of a pregnant uterus predisposes to twisting, so does the fact that the tumour is a dermoid. The probable explanation is that one swelling helps to roll the other over, and that dermoid tumours, being lighter than ordinary ovarian tumours, are more easily rotated.

The causes of torsion have been largely discussed, but there is little real knowledge of them. Chronic constipation, congenital or acquired defects in attachment, and in the case of ovarian cysts alternate distension and collapse of the sigmoid flexure and urinary bladder, movements of the abdominal wall, and peristaltic movements of the intestines have been specially mentioned. It is possible that in some cases the omentum, recognizing the tumor as an intruder, tries to hustle it and thus starts the twist.

In the great majority of cases the twist is from left to right. The reason for this has been widely disputed, but it has apparently been forgotten that a left to right twist is an inherent physiological trait which reveals itself amongst other instances in the heart's beat, in the

Fig. 21. Volvulus of small intestine.

development of the gastro-intestinal tract, and in the contractions of the uterus during labour.

The pathological changes that occur in connection with twists are in all cases similar, and are due to interference with the local circulation. If recognized early, the twist can be undone. Later changes, due to inflammation and matting of the surrounding tissues, may obscure the cause of the condition.

The first change is an engorgement of the veins of the organ twisted, with an effusion of blood-stained serum, into the peritoneal cavity, or into the tunica vaginalis if the case is testicular. Then follow extravasation of blood into the affected organ, total arrest of the circulation, and gangrene. Afterwards the dead tissue acts as a foreign body and peritonitis ensues. Organisms from the surrounding intestines penetrate the dead or dying tissues, and an abdominal abscess results. Or, in the case of small ovarian cysts and those damaged gradually by a series of twists, a new circulation can be established through new vessels formed in omental adhesions, and following on such a history an ovarian tumour may then be found growing in and from the omentum. More rarely still entire absorption of the gangrenous mass may take place. Death is, however, the usual and expected result.

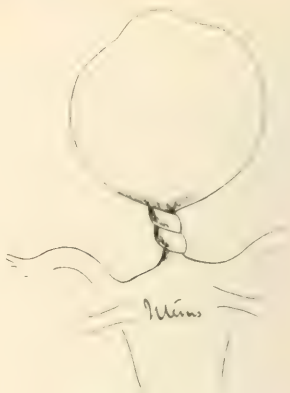

Fig. 23. Volvulus of subperitoneal fibroid.

In all cases the attack commences suddenly with severe pain increasing steadily in intensity, and accompanied by vomiting, by the symptoms of collapse, and by suggestive tenderness to pressure over the involved organ. Then

Fig. 22. Volvulus of sigmoid.

Fig. 24. Volvulus of ovarian cyst.

peritonitis may follow. In all cases the attack may steadily progress to a fatal issue, and in well-pronounced instances this is the rule. The majority, however, give a history of one or many previous attacks, which have either been recovered from very rapidly, or else somewhat slowly. In the former the twist had become undone, and of this we have obtained overwhelming evidence. In the latter the effects had passed off, but a permanent twist remained.

Bowel and ovarian cases in which several twists had occurred have come under our notice, and in these the last attack had been preceded by many of a similar character. It was clear that though several old-standing twists were present, the last was *the* cause of serious mischief. No dangerous result may follow even five or six twists, the result depends on the effect on the local circulation. Half a twist with a short broad pedicle may be more serious in its results than half a dozen when the pedicle is long and narrow.

The diagnosis in this, as in all other abdominal emergencies, has to be made between ruptured gastric or duodenal ulcer, appendix perforation, gallstones, intestinal obstruction, ectopic gestation, and other causes of peritonitis.

The treatment of all internal twists is the same, viz., by operation as early as possible.

For the illustrations I am indebted to Dr. G. W. Richardson, F. R. C. S.

ON THE RELATIONS BETWEEN THE OVARIES AND THE UTERUS

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(From the Experimental-Biological Department of the Pathologic Institute, University of Berlin)

THE researches of Strassmann, Halban, and L. Fraenkel on the relations between the ovaries and the uterus may be considered the most important experimental works on this subject. Strassmann (1) wished to prove experimentally that the menstrual alterations of the uterine mucous membrane were excited by ovulation. The starting point of his experiments was the question whether the principle of Pflüger's hypothesis could be thus demonstrated. For a test animal he chose the female dog. Although rut and menstruation differ in some details, they are in the main identical; there is no essential difference in their external and internal phenomena. The experiments reported by Strassmann show that an increase of the intra-ovarial pressure in the dog by injecting a fluid into the ovaries causes alterations in the endometrium. These are accompanied by phenomena in the genitalia resembling in many respects those of rut. The stimulations issuing from the ovaries are probably collected in the nerves and ganglia and transmitted; thus from those organs the alterations of the uterine mucous membrane are brought about. Strassmann says: "The continual stimulation, caused by the injected masses, brings about a continual vascular excitement of the tracts supplying the uterus." The stimulation in the ovaries produces therefore a reflexive hyperemia of the uterus whereby rut, that is, menstruation, is supposed to be produced. This idea is distinctly pronounced by Strassmann in these words: "The pressure of the growing follicle upon the sensory nerve terminations of the ovary acts by reflexes upon the vasomotor nerves of the genitalia."

According to our opinion the phenomena observed by Strassmann may likewise be regarded and explained as a sign or consequence of this hyperemia. It is not unusual that stimulation in the area of the genitalia produces uterine hyperemia. We injected in three dogs, into the peripheral end of one horn of the uterus, after having applied a peripheral ligature, one drop of tincture of iodine. In two dogs we observed the following day and during 3 to 4 days a distinct hyperemia of the vagina, a redness of the clitoris and an increased secretion of mucus; at the same time the animals were constantly persecuted by the male

dogs. In the dissection on the sixth day we did not find the characteristic phenomena of rut, that is, the macroscopically visible swelling of the uterine horns with the changing of their flat form into a more round shape, but found only a stong hyperemia produced by the irritation in the area of the genitalia. We consider it, however, not at all demonstrated, that such a hyperemia brings about rut or menstruation.

Moreover Pflüger's hypothesis with Strassmann's experimental support was entirely contradicted by the results of Halban (2). After the transplantation of ovaries (subcutaneously, into the muscles, into the omentum) in baboons, menstruation continued in 2 of 4 animals. After the extirpation of the grafted ovary in one animal, menstruation ceased entirely. Consequently Halban explains the process by the secretion of a chemical substance in the ovaries which passes into the blood and then probably exerts through the nerve tracts a specific irritation of the uterine mucous membrane so that the latter undergoes menstrual alterations. Halban therefore does not speak of hyperemia, but of a specific irritation being the cause.

L. Fraenkel (3) attempted to define more precisely the rôle of the ovaries on the basis of his extensive though not reliable experiments, by assuming important functions for the corpus luteum in the production of menstruation. "Menstruation is caused by the secretory action of the corpus luteum. It is not the pressure of the growing follicle upon the ovarial nerves, but the action of the corpus luteum that causes menstruation. That structure causes every four weeks the cyclical hyperemia of the uterus which leads either to pregnancy or to menstruation." We shall further on consider the significance of the corpus luteum more thoroughly. At this point we wish to deal again with the opinion according to which hyperemia is supposed to be the cause of menstruation, producing the various alterations of the genital organs. We reject decidedly this opinion for the following reasons.

Although we had rejected the supposed action of yohimbin on rut and ovulation on the basis of our previous experiments (Experimental Contributions to the Action of Yohimbin on the Female Genitalia, Berl. klin. Woch., No. 42, 1907), new experiments on the mentioned subject with this substance seemed to furnish a more exact information. That yohimbin exerts a hyperemic action on the genitalia was also demonstrated by our results. But it is not at all proven that such a continued hyperemia causes by itself rut, as Loewy (4) and Holterbach (5) claim. We have obtained obvious results by the following experiment:

Three small female dogs of 6,700, 6,900, and 8,800 grams, which had whelped 4 to 5 weeks before and were thus naturally in condition in which rut could not be present, were given several times a day per os a dose of 0.0025 gm. of yohimbinum lacticum Spiegel, a dose quite sufficient according to the researches of Holterbach for the production of rut. The dose was given at the following times:

1st day	8	10	1	3	5
2d "	7	9	11	3	5
3d "	8	10	12	3	6
4th "	8	10	11	3	6
5th "	8	10	1	3	6
6th "	8	10	1	3	
7th "			11		5
8th "	8	10	2	4	
9th "	7	9	11	2	
10th "	7	9	12	3	6
11th "	8	10	1	3	5
12th "	7	10	1	3	6
13th "				4	6
14th "		10	12		
15th "	7	9	11	2	6
16th "	8	10	1	3	
17th "	7	10	1	3	5
18th "	7	9	12	2	6
19th "	7	10	1	3	5
20th "	7	9	11	3	
21st "			11	12	6
22d "	8	10	2	4	6

By this continual giving of yohimbin per os we undoubtedly produced a continuous hyperemia of the genitalia, as was demonstrated also by the clinical symptoms. On the third day the dog of 6,900 gm. showed a strong mucous discharge; on the fifth day the secreted fluid was hemorrhagic, the genitalia were very soft and hyperemic. In performing laparotomy on this animal after 11 days, we noticed nothing peculiar in the ovaries, but in the horns of the uterus, not showing the macroscopical appearances of rut, were 5 small thickenings. They could be the residuals of the old egg-insertions, yet more likely the signs of a new pregnancy. The hemorrhagic vulvar excretion

continued. The animal was killed and dissected on the 23d day. The five thickenings of the uterine horns had increased; on cross section they did not yet show a distinct macroscopic amniotic membrane. The ovaries showed some very slightly marked corpora lutea. The animal was, therefore, in statu graviditatis. The animal of 6,700 gm. showed after 8 days a pronounced mucous secretion with vulvar hyperemia. It was subjected to laparotomy after 12 days, no distinct alterations being observed in the ovaries or the uterus. In the dissection on the 23d day we found the same macroscopical condition; though the mucosa of the uterus was strongly reddened and showed here and there hemorrhagic spots, there were no real rut phenomena. Just as little was shown by the third animal in which during the whole course and in dissection was found only a hyperemia of the genitalia.

We consider the following conclusion justified: These experiments confirm that yohimbin is able to produce in the pregnant as well as in the non-pregnant uterus a mucous and even hemorrhagic discharge following a hyperemia of the genital organs. A continual hyperemia however (23 days) did not produce rut, and since no fact suggests ascribing to yohimbin the power of restricting rut, we think it is justified to generalize and to presume: The hyperemia is not the starting point of rut nor of menstruation; it is only a part of this symptom-complex, as, for instance, it is also represented in the phenomena of inflammation. The starting point of rut or menstruation in the uterus is, therefore, not of vasomotor origin; there is here a much more extensive specific action.

If we now examine more thoroughly this action we will find facts in opposition to Fraenkel's hypothesis. 1. The assumption that, after rupture of the follicle, the development of the corpus luteum produces menstruation, compels one to assume furthermore that the maturation and rupture of the follicle and menstruation are in a regular causal relation to each other, which would contradict the extensive observations of Leopold (6) and Mironoff (7). 2. As in animals rut continues for weeks, whereas in the human menstruation is completed in 2 to 5 days, we must logically, on the basis of Fraenkel's hypothesis, see the cause of this phenomenon in the fact that in animals several follicles undergo maturation and burst, consequently forming several corpora lutea in succession, thus making the specific action (not only of the vasomotor reflexes) continuous. Now we have in the course of previous experiments (l.c.) observed that after a bilateral ovariectomy in a dog at the beginning of rut, the latter, that is, in this case only the specific alterations in the area of the uterine horns, could continue for weeks. If, therefore, these alterations are dependent upon the ovaries in so much that after their extirpation rut does not occur, yet these alterations are so far independent that, having begun, they are able to continue. The persistence of the alterations is, therefore, certainly not the consequence of an internal secretion of the corpora lutea, since the ovary has been extirpated. 3. The failure of menstruation in women after burning out the corpus luteum, or after preventing the development by destroying the follicle with the cautery, would be an undeniable argument if such a failure would never occur after operations, and if, on the other hand, the burning of another part of the ovary would never have such consequences. Now, as to the former, failures do occur, and the latter has never been tried. Concerning the second objection we know only that the so-called influence of the corpus luteum upon the development of the ovum, demonstrated by the cauterization of the corpora lutea, also appeared in a high degree in Fraenkel's experiments by simply burning a hole in the ovary. We believe the following conclusion is justified: *Even if the theory of Fraenkel is confined to the statement that "the origin of menstruation and of rut is to be ascribed to the specific action of the internal secretion of the corpus luteum", this function of the corpus luteum is, at the present stage of researches, to be regarded as a hypothesis only.*

The corpora lutea have furthermore, according to the theory of Fraenkel, by an internal secretion the "function of causing the insertion of the ovula and of securing their further development." 1. The presumption of the corpora lutea having the function of causing the insertion of the ovum is, in our opinion,

only with difficulty to be brought into concordance with clinical facts. If without pregnancy only a corpus luteum spurium is formed and after conception a corpus luteum verum, this can only be due to an irritation by the fecundated ovum; the latter consequently stands necessarily in connection with the uterus before the impulse for the formation of the corpus luteum verum is given. With the theory of Fraenkel we are compelled, in order to avoid conflicting with facts, to assume that the fecundated ovum produces the formation of the corpus luteum by some influence upon the genitalia, and that the corpus luteum then causes, by an internal secretion, the insertion and the further development of the ovum. Such a process would, however, appear extraordinarily complicated. 2. If Fraenkel cauterizes the corpora lutea, a retrogressive transformation of all ovular chambers occurs. If he, however, only burns a hole into the ovary, outside of the corpora lutea, he observes in one case (xci) a general, in another (xc) a partial, retrogressive transformation. Where is the specific function of the corporea lutea? 3. If Fraenkel claims that after the replacement of the corpora lutea, extirpated from the ovaries, into the abdominal cavity, only a slow retrogressive transformation takes place, in contradistinction to a rapid one, this assumption is not at all justified by the protocols added. In 7 pregnant rabbits he extirpated both ovaries. For one animal (cix) the date of dissection is not noted; therefore no conclusion can be drawn. Three animals were sacrificed after 8, 6, and 5 days (xxix, lvii, cv); retrogressive transformation of all ovula. Two animals, sacrificed after 5 days, show, just as the former, a rapid retrogressive transformation of the ovula. In one animal the replaced corpora lutea had not become adherent, in the other one had only replaced ovarial tissue without corpora lutea. Finally in one animal (cvii), sacrificed after 3 days, in which the replaced corpora lutea were adherent, signs of a slow retrogressive transformation were observed. We seek in vain for the elements necessary for comparison.

Since this question of the significance and the function of the corpus luteum appeared to be of great importance from a gynecologic standpoint (compare, for instance, the conditions in cystic mole and chorionepithelioma) we have made a series of new experiments on this subject. Although as yet they are incomplete, we report here the first results, because they appear to furnish a support to the above explanations.

As Fraenkel in his experiments with ovariectomy had obtained suppuration and adhesions in the great majority of his cases, consequently impairing his conclusions dealing only with the fact of ovariectomy, we sought a more simple and less objectionable method and prefer that of ovariectomy from the back in guinea-pigs. Test experiments soon showed us that it is possible in this way to remove the ovaries very much quicker and with less danger. After having shaved a small area of the skin on the dorsum of the animal and disinfected it with soap and alcohol, we make a median incision of about one-fourth inch from the inferior end of the thorax. Then we pull one skin margin aside and push two blunt needles through the abdominal muscles, one-third inch from the median line and about 5 mm. below the costal margin. We thus produce, by separating the needles, an opening exposing the parametral fatty tissue. After seizing the latter with the forceps, it is brought to the surface by slow and uniform traction. Soon the tube and ovary appear; the latter is ligated, cut off, and the stump replaced. The same is done on the other side. Then the skin is simply shoved over the muscle wound and the margins sutured, without including the muscle. The area is covered by collodium. As a rule the operation is perfectly uncomplicated, and healing is excellent. The adhesions produced in the abdominal cavity are practically insignificant since the horn of the uterus is only at its upper end in communication with the point of ligature in the ovary; in dissection the latter is often found entirely movable. If the parametral fatty tissue cannot fill out the produced space, one can go carefully with a forceps, of course not a surgical forceps, into the depth; it is then usually possible to catch the parts. For the regular course of the operation a light narcosis, we use ether, is necessary. We have explained all the details of our method on account of its being a rapid, simple, and with

some asepsis quite safe method of ovariectomy. Just in this line experimental gynecology needs still to furnish many results.

As the first point we tried to determine the influence of bilateral ovariectomy on the pregnant animal.

No. 1. In the second to fourth weeks of pregnancy; bilateral ovariectomy. Dissected after 7 days; small local thickenings of the uterine wall.

No. 2. In the second to fourth week of pregnancy; bilateral ovariectomy. Dissected after 8 days; only small local thickenings.

No. 3. Idem.

No. 4. Idem.

No. 5. In the third to fourth week of pregnancy; bilateral ovariectomy. Dissected after 10 days; only small local thickenings of the uterine wall.

No. 6. Idem.

No. 7. Idem.

No. 8. In the third to fourth week of pregnancy; bilateral ovariectomy. Dissected after 11 days; only local thickenings.

No. 9. Idem.

That this series of animals were pregnant at the time of operation is confirmed by —

1. The animal was put to the buck immediately after whelping.

2. In most animals the ovula could be distinctly felt.

3. The ovaries showed pronounced corpora lutea.

4. The local thickenings with small hemorrhagic spots in the uterine wall and on the uterine mucous membrane found in dissection represent an extraordinary finding. The local thickening exists during some days after normal whelping instead of the former ovular insertions.

No. 10. In the fourth to fifth week of pregnancy; bilateral ovariectomy. Dissected after 12 days; in the left horn of the uterus a dirty, thick, brown fluid, in the right two fairly dry and solid corpora of 8-10 mm. length. No embryonal form to be recognized. Large yellow spots indicate the high fat content. These bodies are connected with the uterine wall by a thin membrane.

In addition we made experiments on animals known to be more resistant, namely, white rats.

No. 11. White rat surely pregnant for 8 to 12 days; bilateral ovariectomy. Dissection after 13 days. Horns of the uterus quite normal.

No. 12. Idem.

No. 13. White rat in fifteenth to twentieth day of pregnancy. (Pregnancy lasts in the rat 4 weeks, in the guinea-pig 9 weeks.) Bilateral ovariectomy. Dissected after 10 days; horns of uterus normal. Remarks: After 3 days was noticed a hemorrhagic discharge from the vagina.

On the basis of the above described 13 experiments we believe to be authorized the following conclusions:

Bilateral ovariectomy in the pregnant animal always interrupts pregnancy during more than the first half of its duration. Nos. 13 and 10 (left horn) indicate an abortion, which may also have occurred in several of the other animals. No. 10 showed at the same time a real retrogressive transformation of the ovula, as Fraenkel, in our opinion incorrectly, assumes for all of his cases, even those where ovular cavities the size of a walnut had totally disappeared within 5 days (cv).

Several different factors can contribute to an interruption of pregnancy, and we also made experiments in this direction.

No. 14. Pregnant guinea-pig, third to fourth week. The operation was performed in the same way but instead of the ovaries large portions of the parametrium and of the mesentery were ligated and cut off. Sacrificed after 12 days; the horns of the uterus are severely hydrosalpingitic and swollen. On one side are three, on the other one embryo in copious amniotic fluid and well preserved.

No. 15. Third to fourth week of pregnancy. On the one side the ovary was extirpated, on the other the parametrium ligated, the ovary left. Sacrificed after 11 days; in one horn of the uterus a well-preserved embryo 7 to 9 mm. in length. In the other, on the side the ovary remained and in which several corpora lutea are found, there exists a degenerated mass of tissue 5 mm. in length with yellow spots; no embryo to be recognized.

No. 16. Second to fourth week of pregnancy. Bilateral ligature of broad portions of the mesentery and mesometrium. Died in three days of peritonitis. Neither ovary had been ligated. Two quite empty fetal chambers; no embryo to be recognized.

No. 17. Second to fourth week of pregnancy. Unilateral ovariectomy. Sacrificed after 7 days. In the remaining ovary three perfect corpora lutea. In the horn of the uterus of the same side three thickenings of the uterine wall with hemorrhagic spots, as we had found in the other retrogressive transformations.

No. 18. Pregnant guinea-pig, third to fourth week. Unilateral ovariectomy; on the other side the parametral tissue was simply drawn through the incision and replaced. Dissection after 4 days; at the remaining ovary a well-developed corpus luteum. In one horn of the uterus one, in the other 4 strong local thickenings of the uterine wall, without a trace of fetal residue.

Conclusion. If experiments 14 and 15 speak for the influence of the absence of the ovary and for the rôle of the internal secretion of that organ, so experiments 16, 17, and 18 suggest care in a generalization of the explanation, and experiments 15, 17, and 18 advocate distinctly the assumption of a specific function of the corpus luteum. It would not be surprising if only the trauma of ligating and extirpation of both ovaries should be sufficient always to cause the interruption of pregnancy.

The corpus luteum being regarded the secreting tissue, important for menstruation and the development of the ovum, L. Fraenkel has used the copious administration of this tissue for combatting the complaints of amenorrhea and the menopause. If the rôle of the internal secretion of the corpus luteum is a fact and if, as Fraenkel asserts, the internal administration is effective, it appears to us somewhat strange that one should combat with this substance secondary symptoms only, without being able to influence the chief process to which these symptoms are due, that is, menstruation itself. If the internal administration be effective, the copious ingestion of this substance by the pregnant animal which has undergone ovariectomy should show a distinct influence. To test this we added to the food of pregnant animals, after ovariectomy, ground lutein tablets, so that on the average each animal received 1.5 tablet daily, corresponding perhaps to 20 to 50 times the lutein tissue contained in its ovaries.

No. 19. Guinea-pig in about the seventh week of pregnancy; bilateral ovariectomy; lutein. Dissected after 4 days; horns of the uterus contracted, the placenta forms on the external surface prominent sinuses. In the oval chambers 4 embryos 4 to 4.5 mm. long, two sanguinolent with hemorrhage in the cutis; in the two others the process beginning. The fetuses were therefore surely dead.

No. 20. Highly pregnant, sixth to seventh week; bilateral ovariectomy, lutein. Dissected after 3 days; one horn of the uterus strongly thickened, in the other two ovular chambers, the external one empty with a preserved large placenta, the upper one containing an embryo 3.5 to 4 mm. long. The animal was therefore certainly about to abort.

No. 21. Pregnant, third to fourth week; bilateral ovariectomy, lutein. Dissected after 4 days; horns of the uterus of a normal shape. At one horn hangs quite laterally yet still in the lumen a soft mass of tissue, 5 to 6 mm. broad. Nothing distinctly recognizable.

Nos. 22, 23, 24, 25, 26, pregnant animals in the third to fourth week; bilateral ovariectomy, lutein. Dissected after 7 days; in 24 and 26 the uterine wall on both sides is distinctly swollen, in 22 unilaterally a small thickening; in 23 and 25 nothing abnormal to be recognized.

After these experiments with lutein tissue regarded as the only active substance in the ovary, we made for comparison similar experiments but instead of lutein employed tablets of oophorin. We therefore gave the animals in these tablets the whole ovarial tissue, adding thus undoubtedly a large quantity of inactive tissue. For producing a distinct influence the conditions were therefore far more unfavorable.

Nos. 27, 28, 29, 30. Pregnant guinea-pigs, third to fourth week; bilateral ovariectomy, 1.5 tablets of oophorin per animal each day. Dissected after 8 days. 28, horns of the uterus not distinctly visible. 29, in the horns of the uterus 4 small, about 5 mm. long, solid bodies, one with a yellowish appearance. 27, the horns of the uterus contain two bodies, similar to the former. 30, just about to abort. One horn of the uterus contains a thick, brown fluid only, the other two bodies 5 mm. long, lying loosely in the horns of the uterus, a similar one in the vagina.

If it is allowable to assume from these internal administrations an influence retarding retrogressive transformation, it must be ascribed to the oophorin. These experiments will be continued.

Reviewing briefly the opinions advanced in this report on the basis of our results we say: An irritation in the area of the genitalia may produce a hyperemia of the uterus; this hyperemia is, however, to be distinguished thoroughly from rut or menstruation. Hyperemia is only one of the symptoms of rut or menstruation without possessing in this direction any causal significance. For the production of rut or menstruation therefore the ovaries do not act by the production of hyperemia of the uterus but by a specific influence, the latter being necessary for the beginning only of the phenomenon, not for its further development. In the present stage of researches the role ascribed to the corpus luteum for the excitement of rut or menstruation is to be regarded as a hypothesis only. In the pregnant guinea-pig and rat bilateral ovariectomy interrupts pregnancy in more than the first

half of its duration. To cause this interruption, however, several factors work together (against Fraenkel), to which our experiments undoubtedly point without, it is true, defining them more precisely. The internal administration of lutein after ovariectomy does not exert the slightest influence toward preserving pregnancy. At present we can say little of the effect of oophorin. *At present the hypothesis of the specific function of the corpus luteum with regard to the imbedding and development of the ovum must be considered as being in disagreement with certain distinct clinical and experimental observations.*

But we dare to go one step further. For the above-mentioned reasons we do not regard the corpus luteum important for the insertion and the development of the ovum. Consequently we are not allowed to ascribe the greater development of the corpus luteum verum, sive graviditatis; in proportion to the spurium, sive menstruationis, to the hyperemia of pregnancy. For if this were an effect of hyperemia, the corpus luteum ought to have developed very strongly in our experiment with yohimbin on the pregnant dog, as the corpus luteum then should develop up to the end of pregnancy.

In a few words we wish to explain our conception of the significance of the corpus luteum verum. When in the insertion and development of the ovum the organism is compelled to restrain the embryonal proliferation of the chorion, it is in a condition in which the cells of the follicle epithelium (which by their origin and evolution have preserved more similarity to embryonal cells than the usual body-cell) are able to proliferate extraordinarily. Very soon, however, in the third or fourth month of pregnancy, the exochorion shows a diminution in its capacity for proliferation and even undergoes a certain atrophy (disappearance of the syncytium). Then likewise the development of the corpus luteum verum ceases. There are thus, according to our opinion, parallel phenomena dependent upon the same general condition. Thus also in cystic mole the hyperplasia of the lutein cells would not be the cause (Pick, 8; Jaffé, 9), or the consequence (Dunger, 10) of the formation of the mole, but the synchronous expression of a general pathologic condition which at present is not known.

REFERENCES.

1. Strassmann. Beiträge zur Lehre von der Ovulation, Menstruation u. Conception. Arch. für Gynäkologie., bd. 52.
2. Halban. Ovarium und Menstruation. Verh. d. deutschen Gesellschaft f. Gynäkol., ix, 1901.
3. Fraenkel, L. Die Funktion des Corpus Luteum. Arch. f. Gynäk., bd. 68, 1903.
4. Loewy, A. Therapie der Gegenwart, Juli, 1901.
5. Holterbach. Deutsche Tierärztliche Wochenschrift., xv, 13 u. 14.
6. Leopold. Untersuchengen über Menstruation und Ovulation. Arch. f. Gynäk., bd. xxi, 1883.
7. Leopold und Mironoff. Beitrag zur Lehre von der Ovulation und Menstruation, Arch. f. Gynäk, bd. 45, 1804.
8. Pick, L. Zur Frage der Eierstocksver änd. bei der Blasenmole. Zentralbl. f. Gynäk., No. 34, p. 1,083, 1903.
9. Jaffé. Blasenmole und Eierstock. Arch. f. Gynäk., bd. 70, heft 3.
10. Dunger. Chorionepithelioma und Blasenmole. Beiträge f. Path. Anatomie u. fur allg. Pathologie, bd. 37, 1904.

A CONSERVATIVE TREATMENT OF SARCOMA

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SUMMARY

SARCOMAS fall into two clinical classes: (*a*) those relatively benign, comprising the majority of the central sarcomas of long bones, the myelomas, giant-celled sarcomas, and certain fibro-sarcomas, which may be eradicated by simple resection, enucleation, or, at times, even by curettement; and (*b*) those very malignant, including the periosteal sarcomas of long bones, the melanotic, small round-celled and neuro-sarcomas, which almost invariably lead to death within a few years after their appearance, despite the most thorough excision, resection, or amputation known to surgery.

2. Early and more radical operative measures of great value in combating carcinoma have increased the early mortality and have not clearly decreased the tendency to recurrence and metastasis in sarcoma.

3. High amputation, usually unnecessary, and unjustifiable for the more benign sarcomas, usually is unavailing against the more malignant.

4. Of the very malignant tumors, sarcomas are most prone to spontaneous disappearance, or to retrogression after X-ray treatment, the injections of certain toxins, or after pyogenic infections; on the other hand, they are least amenable to radical operative treatment.

5. Traumatism is the most powerful localizing agent for the primary growth in sarcoma; operative traumatism the most powerful localizing agent for the recurrent growth; in other words, excise, resect, or amputate where you will, the return of the sarcoma usually will be in the scar.

As a corollary:—

6. Operative traumatism should, as far as possible, be limited to the field of the sarcoma, so that recurrence may not be invited to a new or distant point.

7. The life and growth of the primary sarcoma rarely directly cause cachexia or a fatal issue, the death and decomposition of the tumor-cells are the most potent factors in the production of cachexia and a frequent cause of death of the patient. The duration of life, therefore, is often measured by one's ability to combat necrotic processes in the tumor.

8. Pending the development of better therapeutic agents, the combination of (*a*) judicious subcapsular enucleation, (*b*) massive and prolonged Roentgenism, (*c*) the topical employment of methylene blue or pyoktanin, and (*d*) occasionally the internal administration of certain drugs and toxins is commended as offering results in the treatment of the very malignant or recurrent types of sarcoma superior to those obtained by the most extensive and desperate surgical eradication.

THE FUTILITY OF AMPUTATION

It is difficult to prove the beneficence of amputation for sarcoma. From a lack of careful microscopic study a relatively benign myeloma, a giant-celled sarcoma, a central sarcoma of long bones, or a chondroma may be classed with the very malignant periosteal tumors, and the freedom from recurrence in such a case may be cited as proof of the value of the amputation. Thus, of 68 cases of amputation for periosteal sarcoma of the femur collected by Butlin only one patient was known to be alive three years from the time of operation, and in this case there was doubt as to the periosteal origin of the tumor. Of Butlin's 18 cases of periosteal sarcoma of the humerus treated by amputation, 2 cases of possible cure occurred in patients regarding whom there was a doubtful diagnosis. Again, the patient may recover despite instead of because of the operation. Of Wyeth's 5 cases of disarticulation at the hip-joint for

sarcoma 4 died in from six to twelve months after the operation from return of the disease. The fifth case was least favorable, the disease having already invaded the acetabulum which was curetted at the time of the operation, but free excision of the diseased area was not made. A severe pyogenic infection developed in the wound after the operation, and as the amputation could not be classed as a radical extirpation of the sarcoma it seems probable that the infection rather than the operation is to be credited with the apparent cure in this case. Similarly, after 6 disarticulations of the hip-joint done by Coley for periosteal sarcoma none was known to be alive eighteen months from the time of operation. A seventh patient refused amputation and was treated by X-rays, the injection of mixed toxins, drainage, and curettage, and yet despite the occurrence of two large metastatic growths in the trunk, the man was apparently well five years after the operation. Again, in 2 other cases of apparent sarcomas of long bone, seen by Coley, operation was refused and the patients passed into the hands of non-professionals who administered herb teas. In both of these cases the sarcomas disappeared. It is, therefore, evident that the benignancy of the particular tumor, the influence of various pyogenic infections, and the tendency for spontaneous disappearance occasionally noted in sarcoma must be excluded, before we can positively attribute a cure to the operative procedure. It is less difficult to find evidence that operative treatment is distinctly harmful. Wyeth's statistics show a primary mortality of about 11 per cent from the bloodless method of disarticulation at the hip-joint for sarcoma. Morel's statistics show no mortality when the modern interscapulo-thoracic amputation of Berger is done for benign growths (10 cases); a mortality of 3.12 per cent when it is performed for sarcoma of the humerus (64 cases); and an operative mortality of 25 per cent when performed for sarcoma of the scapula (20 cases). After this extensive operation for sarcoma of the humerus about one half of the patients soon show generalization or recurrence of the growth, with an average longevity of nineteen or twenty months. Of the 75 per cent who survive the operation for sarcoma of the scapula over two thirds die of recurrence or metastatic growths, with an average duration of life of only thirteen months. Permanent cures from operation for sarcoma of the humerus, proven to be periosteal and not central or myeloid, are almost unknown.

THE INCIDENCE TO ACCIDENTAL AND OPERATIVE TRAUMATISM

Prolonged or frequently repeated irritations favor the development of carcinomas; abrupt violent injury that of sarcoma. Thus the prolonged irritation of a clay pipe, a carious tooth, gall-stones, inveterate or protracted ulceration, eczematous inflammation, irritating cicatrization, or the friction of paraffin or soot impregnated clothing often precedes the development of carcinoma. A severe contusion, a crushing injury, or a fracture seems often clearly to predispose to sarcoma. In our series one patient in stooping struck her head violently against a table, and within two months there developed an enlargement from a sarcoma of the frontal bone. A second case, a robust young man, was thrown violently against a car seat, bruising the testicle; within a week the organ was nearly twice the normal size from sarcomatous change. A third patient had a heavy fall upon the shoulder, and the pain of the injury merged into that from a rapidly growing sarcoma of the upper end of the humerus. In a fourth case there was severe pain in the leg following the strain from a misstep, which continued until the leg was amputated for sarcoma of the popliteal space about eight months later. In a fifth case a physician in taking apart a bedstead hit himself a violent blow under the jaw, and one month later a melanotic sarcoma had developed in the region of the injury. A sixth case was that of a little girl who was struck by a stick over the left side of the jaw, and one month later a round-celled sarcoma was palpable on the mandible. The seventh patient accidentally struck his knee, and within four weeks a rapidly growing sarcoma of the lower end of the femur was noted. An eighth case was that of an elderly woman who developed melanotic sarcomas of the ankle following the irritation of an ill-fitting shoe. Two similar

cases in which the foot was irritated by projecting nails in the shoe are recorded by Bland-Sutton. In about one third of the cases of sarcoma the history shows a suggestive relationship to some form of traumatism. If it be admitted that traumatism is a powerful determining or localizing factor in the development of a primary sarcoma, an association between later traumatisms and recurrences or secondary growths may reasonably be expected. Of special importance is the relationship between operative traumatism, which is the most constant and severe type of injury patients with sarcoma endure, to the recurrent growths. Strangely enough, the fact that recidivity usually takes place in the operative scar seems to have attracted little or no attention. Apparently it makes little difference where the scar is placed, for if amputation be done at the knee, the tumor returns in the stump; if at the hip, the tumor returns about the cicatrix. In one patient, observed by a confrere, after an amputation at the elbow for sarcoma of the wrist the tumor returned in the elbow stump; disarticulation was then done at the shoulder-joint, and the sarcoma recurred in the shoulder; whereupon an interscapulothoracic amputation was performed which was followed by a rapid recurrence in the wall of the thorax adjacent to the scar. A second patient had an inoperable sarcoma of the orbit and apparently entirely recovered under X-ray treatment. Some time later a rhinologist resected an enlarged turbinate. This slight operation was promptly followed by a recurrence *not in the orbit, but in the nose*, the tumor progressing rapidly to the death of the patient. The time-worn observation that slight operations for warts or moles may induce rapidly progressive sarcomatous changes seems to be founded upon more than a mere coincidence. It may be evident that we consider the essential cause of sarcoma as being diffused through the body prior to the development of the local lesion. A child falls upon the back and develops Pott's disease, involving the body of a certain dorsal vertebræ; a youth is struck on the thigh and develops a sarcoma of the femur. It is as logical to consider that the tubercle bacilli originated in the vertebral body in the first case as to consider that the essential cause of sarcoma originated in the femur in the second. Altogether we feel justified in asserting that traumatism is the most powerful known predisposing factor for the primary growth in sarcoma and that operative traumatism is the most potent factor in determining the site of recidivity.

INDICATIONS FOR CONSERVATIVE TREATMENT IN SARCOMA

Amputations are demanded for the removal of limbs, disorganized or rendered functionally useless by the presence of malignant growths. Amputations are not indicated for sarcomas of the extremities that have not rendered the part incapable of function, unless there be a fair promise of greater longevity and increased comfort after such operation. As against amputation there is the immediate high mortality, the mutilation, incapacity, and the mental distress. If equal comfort and longevity are possible under conservative measures, these are clearly indicated. For periosteal sarcoma of the femur, for example, if under conservative treatment 90 per cent of the patients show an average duration of life of 12 to 18 months with a fair degree of personal comfort, and 10 per cent of the patients live for a longer period of time, this is distinctly preferable to having an immediate mortality of 11 per cent for disarticulation of the hip-joint and no greater average longevity to recompense the patient for the operative agony. Occasionally a patient, after disarticulation of the hip-joint for sarcoma, remains free from recurrence for three or four years, yet to obtain this occasional result it must be considered that eleven patients out of one hundred must be immediately sacrificed, and that over eighty out of every hundred will be subjected unavailingly to one of the most formidable and mutilating operations known to surgery. Moreover, as shown by Mikulicz and his followers, the ultimate results following excision or resection of bone for sarcoma are superior to those obtained by amputation. Likewise, for the extensive sarcomas involving the walls of the thorax, the pelvic bones, the maxillary antrum, and other situations where there is a high immediate mortality with but slight chance of complete eradication from the radical operation; conservative treatment,

even though offering but little in the way of a permanent cure, if it presents any hope of prolonging life or increasing comfort, is carefully to be considered. In any case, however, the decision as to type of treatment should be determined by the patient or his friends after the average results obtained by different measures have been explained. For recurrent sarcomas the outlook is much graver, and it is for these cases especially that we would urge the further trial of a conservative form of treatment. Personally we are impressed by the thought that the less radical treatment is best for nearly all forms of sarcoma, but here opinion should be reinforced by larger experience.

METHOD OF TREATMENT

The measures that have been employed against malignant tumors include operative removal, the local use of radiant energy, topical applications or injections of chemicals, the internal administration of certain drugs and toxins, and a general roborant regime. The method of treatment that we would here advocate consists of certain of the milder surgical measures combined with a more persistent and thorough use of X-ray treatment than usually is given; certain topical applications and the administration of certain inhibitory agents. None of these measures are new, the combination and method of application of these generally known principles are the novel features of the treatment.

I. THE FIELD OF SURGERY

We have indicated that operative treatment favors recidivity. It is likewise probable that metastases to internal organs, if they be not favored, at least are not prevented by operative invasion. Two other factors, however, menace the life of the patient, and against these surgery is most valuable. First, the tumor by its size or pressure may interfere with important functions, and second, and more common, the tumor in its growth exceeds its blood supply and undergoes necrosis and decomposition, so that quantities of dead and decomposing cells lie in the vascular absorptive area of the living part of the tumor. Then it is that quantities of septic and saprophytic products are absorbed into the body, profuse and recurrent hemorrhages often follow, and the patient falls into a condition of progressive toxemia and cachexia which not infrequently is fatal. That the cachexia of sarcoma comes more from the death and decomposition of the tumor-cells rather than from their life and metabolic activities is indicated by the results of surgical enucleation in these cases. If the capsule of the sarcoma be opened and the necrotic tumor enucleated, then for a time the cachexia usually decreases, the patient gains in weight and in the sense of well-being. If a sarcoma grows beyond the absorptive or expulsive capacity of the organism no matter what the form of treatment, then timely surgical interference is desirable, just as it is in certain massive tertiary syphilitic lesions. The indications for surgical intervention are massive size, pressure symptoms, toxemia, cachexia, and severe local hemorrhages. Usually the preferred surgical measure is what we have described as subcapsular enucleation. This is based upon the fact that, contrary to the prevalent opinion, sarcomas are not infiltrative, but are circumscribed and well encapsulated growths. Even with large growths local infiltrative anesthesia will often suffice. An incision is made down to the capsule of the tumor, and each capsule is in turn incised and its contents evacuated. Usually this may best be accomplished by the finger or hand passed close to the inner surface of the capsule, separating the soft tumor mass from its envelope. In this way from a few ounces to many pounds of tumor may be enucleated within a few minutes. The operation should be done rapidly, to limit the amount of hemorrhage, and violence in the manipulations should be avoided. The adjacent tissue planes should not be opened, and the incision through the overlying skin should be merely large enough to permit access to the capsule of the tumor.

II. TOPICAL APPLICATIONS

After the subcapsular enucleation the capsules are wiped out with dry gauze and immediately painted by the following solution:

Pyoktanin	5 parts
Phenol	1 part
Alcohol	20 parts
Water to make	100 parts

Usually packing of the cavities by sterile gauze is desirable to limit the oozing. Iodoform and other substances that interfere with the action of the X-rays should be avoided. The profuse hemorrhages from a necrotic ulcerated sarcoma are best controlled by binding over the denuded surface cotton compresses wrung out of turpentine. Ordinary gauze compresses may fail to check the profuse oozing.

For putrid decomposition in areas of moderate size local applications without subcapsular enucleation may suffice. If the area be small, the application of pure phenol followed by alcohol and then by the pyoktanin solution may be used, this treatment being repeated daily until the odor is overcome. For larger masses of decomposing tumor more powerful agents are required; the fungus ulcer is cleansed and the cavity packed or thickly dusted with ethylate of sodium; or a compress wrung out of a 33 per cent solution of chloride of zinc is introduced into the cavity. After the larger masses of putrescent tissue are thus destroyed the application of carbolic acid, alcohol and pyoktanin may be resumed. In any case odorous decomposition should not be permitted to continue. For superficial necrosis applications of a 2 per cent solution of picric acid are often valuable in preventing putrescence. Instead of pyoktanin, methylene blue may be used. These anilin colors are not only antiseptic and deodorant, they have a storage capacity for fluorescence and so become especially valuable during the employment of the X-rays. Moreover, there is experimental evidence that such photodynamic substances have a powerful destructive action upon certain bacterial toxins and other poisons.

ROENTGENISM

The most potent single agent known against sarcomatous growth is probably the X-ray. The X-rays have a destructive effect upon all living tissue-cells, but the action is especially pronounced against lymphoid and young connective tissue-cells. Thus, the type of embryonic connective tissue of which sarcoma is composed is especially vulnerable. The rays, moreover, increase the amount of fibro-connective tissue in the area treated and thereby tend to produce a denser encapsulation of the growth and to cause obliteration of adjacent lymphatic channels. There is no reason to believe that Roentgen treatment increases the tendency to metastases. The technique must vary with the patient and the character and depth of the tumor. In general, for the treatment of deep-seated tumors the anode should be about thirty centimeters from the skin; the time of exposure should average from twenty to fifty minutes, the application being divided between two different areas; the object being to have the rays during the course of treatment enter the tumor from every possible direction. Neglect of this point increases the jeopardy to the skin, and decreases the desired action upon the tumor. An old high vacuum tube will usually give the best results, except where a superficial lesion is present, when a lower and softer tube should be employed. In general the quality of rays measuring 6 to 8 upon the Benoist scale will give the best results. As to the amount of current, the measurement of that passing through the primary coil is of little value, but the amount passing through the tube as measured by milliampèremeter is important. Usually one ma. is employed, as it is found difficult to use a greater current and keep the vacuum uniform. In the protection of the skin, the variation in the direction of the rays, the distance of the tube from the skin, and the degree of vacuum as previously mentioned are all important. The use of the Pfahler filter, consisting of a diaphragm of sole leather interposed between the tube and the skin, has also been found to be of much value in protecting the skin. The treatment should be given daily for months, or until the irritation of the skin or the disappearance of the neoplasm suggests the desirability of less frequent exposures. After apparent cure the patient should not relinquish treatment, but should be treated once every two to eight weeks until several years have elapsed. At the outset the patient should be advised regarding the necessity for continued treatment, just as a patient with syphilis is advised; that is, that the lesions may largely disappear within a few months, but the tendency for recurrence may only be overcome by occasional treatments continued over several years.

Apparently those patients do best who show the greatest tolerance for the rays.

CONSTITUTIONAL REMEDIES

As in tuberculosis, the patient should be placed upon a roborant dietetic and hygienic treatment. To increase the fluorescence of the blood during the X-ray treatment, 5 grains of quinine, 3 to 5 grains of fluorescein or 2 grains of methylene blue may be administered from two to four hours preceding each application of the X-rays. If fluorescent substances are being used locally over denuded surfaces, the administration of similar substances by the mouth is unnecessary.

SERUM AND TOXIN TREATMENT

In those cases in which the administration of Coley's mixed toxins is followed by the disappearance of the tumor, the permanence of the cure, from the statistical evidence at hand, seems greater than after any other form of treatment. Unfortunately, the violent chills, the cephalalgia, the high fever, the weakening sweats, and the general exhaustion which follow the use of mixed toxins not infrequently are considered by the patient as unbearable, and he refuses to be further tortured. Not only is the treatment so distressing, but it is also usually unavailing, for even Coley estimates the treatment as only of value in about 10 to 15 per cent of the cases of sarcoma. Thus, not less than 85 per cent of the patients in whom it is used receive no benefit. We employ the mixed toxins, however, in those cases in which results are not obtained by the other mentioned measures. We have had a limited experience with Doyen's serum without clear evidence of its value, although in Case 1 it apparently checked recurrent and very violent attacks of erysipelas that followed the injection of mixed toxins (probably imperfectly sterilized). We have observed no permanent good effects from the use of trypsin or allied ferments.

The following is a report of the cases in which it was possible to carry out the treatment above outlined. In the much larger number of other patients upon whom this treatment was not employed, and in whom the sarcoma was not of the benign type, a fatal issue has been invariable.

CASE 1. *Sarcoma of testicle following traumatism incision. Recurrence. Castration. Recurrence in opposite lymphatic glands. Patient in good health after two and one-half years.*

D. X., aged 32, an athletic man, weighing 220 pounds. His family and previous history are negative. In May, 1905, he was thrown against a car seat, contusing the right testicle. Within a week the organ had nearly doubled in size, but was free from pain or tenderness. Careful measurements showed a progressive and rapid increase in size. Three weeks after the injury an exploratory incision was made, with the diagnosis of hematoma. The blood was found to be in the tunica albuginea intermixed with grayish particles, apparently of broken down testicular substance. The situation of the hematoma suggested a diagnosis of sarcoma. A careful examination of a portion of the excised tunic, however, showed nothing more than a round-celled infiltration. The testicular substance was too diffluent for satisfactory examination. The wound was drained, it healed promptly; but several weeks later a progressive testicular enlargement was again noticed. About the middle of September, 1905, there was a large growth within the scrotum adherent to the skin, together with an enlargement of the cord and the inguinal lymphatic glands. The most thorough excision of the growth, scrotum, cord, lymphatic glands, and adjacent tissues was done. Within a month the left inguinal lymphatic glands and later the deeper glands became palpable. The left testicle remained uninvolved. The patient was given injections of Coley's fluid from which apparently he developed severe recurrent attacks of erysipelas. These attacks recurred weekly, were characterized by widespread erythema, chills, high temperature, by diminution in weight and prostration. Doyen's serum was then given and was followed apparently by diminution in the frequency and virulence of the attacks of erysipelas. The patient was referred to Dr. Pfahler November 11, 1905. At this time the scar on the right side was firm, red, and apparently free from recurrence. In the left groin were two masses, one an inch, and the other one and one-half inches in diameter. Within the pelvis behind the left Poupart's ligament there was a firm resistance suggesting deep glandular involvement, and there were severe increasing pains in the lumbar region that raised the suspicion of retroperitoneal invasion. Later the right groin became indurated. He was treated by daily exposures of from twenty to forty-five minutes by X-ray, excepting on Sunday. At the end of two months the treatments were given three times a week. The glands were distinctly smaller, there was some irritation of the skin, and the pubic hairs were beginning to fall out. At the end of the third month, from 64 treatments, the glands were much reduced in size, the patient was working daily, and there was a diminution in the cachexia. At the end of four months, after about 76 X-ray treatments, the tumors were barely palpable. After six months, about 100 treatments, the patient had gained markedly in weight, but there remained a diffuse induration in the groins. The patient took a course in X-ray therapy, bought a coil

for personal use and moved from town, continuing his treatments. During the summer of 1906, after much hard manual labor, and neglect of X-ray treatment, there was an increasing enlargement in the right groin. This was later injected with methylene blue, but the enlargement persisted and finally opened and discharged. In April, 1907, under local anesthesia, an incision was made through the capsules in the infiltrated glands of the left groin, and a subcapsular enucleation of several ounces of broken down malignant tissue made. Repeated applications of methylene blue were used and the X-ray treatment continued, under which there was a gradual disappearance of the infiltration. Later, from improper care the wound developed a putrid discharge, and vigorous antiseptic and cauterizing agents, as previously described, were necessary. The patient, now over two and one-half years from the onset of the symptoms, has gained about thirty pounds in weight during treatment and is in excellent general health. Three other patients with sarcoma of the testicle have come under observation a short time before or since the above patient came under treatment. These patients had been treated by castration, but the local and X-ray treatment, as above outlined, was not applied. Each of these patients died within six months after first coming under observation.

Case 2. *Enormous recurrent sarcoma of scapula. Prolongation of life for five months under conservative treatment.*

Mr. W. S., age 30, married. Previous history negative. In February, 1905, he noticed a mass the size of a hen's egg over the right scapula. On March 3, 1905, this was excised by Prof. X. In September, 1905, there was a recurrence the size of a hen's egg and a secondary growth in the axilla. September 23, 1905, both growths were excised. In February, 1906, there was a large recurrent growth, and an interscapular thoracic amputation of the arm was urged. The patient then passed from hospital to hospital, but refused amputation. The patient was first seen by Dr. Babcock, October 20, 1906. At this time there was an enormous growth covering the right scapula, extending into the axilla anteriorly, involving the right subclavicular region. It was about one and one-half times the size of a man's head. He was given injections of Doyen's serum, trypsin and methylene blue. The growth progressively enlarged, an area of ulceration, at first the size of a dollar, increased in size, and profuse hemorrhages occurred which were controlled by compresses of turpentine. Intravenous injections of homologous blood were twice given. Great masses of necrotic tumor tissue loosened and were taken away. November 13, 1906, he was referred to Dr. Pfahler for a course of systematic X-ray treatment. He was treated six times a week for two months. To reduce the fetor, to aid in restraining the growth and to increase the fluorescence, applications and injections of strong solutions of methylene blue were employed. Despite these measures, although the growth became somewhat smaller, the area of ulceration and necrosis rapidly increased, the patient became progressively weaker, paler, and more cachectic. After two months of X-ray treatment the man's condition was such that it seemed evident that he would die within two or three weeks, not so much from the tumor itself, but from the sapremia which its necrosis had engendered. The patient was cautiously anesthetized January 12, 1907, and a hurried subcapsular enucleation done. The mass consisted of a great number of disintegrated tumor nodules, enclosed in firm fibrous capsules growing from the anterior and posterior surfaces of the scapula, in the axilla, and over the right anterior thoracic wall, nearly to the sternum. The capsules were split one by one, and the contents shelled out by the hand. The operation required about ten minutes, nearly eleven pounds of tumor being removed through a single opening in the back. Although little blood was lost, the patient was markedly shocked. At the end of three or four days he was able to leave his bed, and ten days after the operation was returned for X-ray treatment. The girth of the chest was reduced ten inches by the operation. He was again treated every week-day for seven weeks, after which he was given three treatments weekly. The wound which was kept continuously coated with methylene blue rapidly contracted and healed. Certain nodules in the axilla, which had been rather neglected during the X-ray treatment, enlarged and were later enucleated under local anesthesia. The patient gained about twenty pounds in weight, lost all cachexia, and had the appearance of good health. The local treatment was also somewhat neglected, and in June, 1907, certain nodules became fetid and necrotic and the patient so rapidly became toxemic that he was unable to go to the X-ray clinic after June 30th. Large doses of trypsin and Coley's fluid were given, hemorrhages occurred, signs of pulmonary involvement developed, and on July 11, 1907, after a third or fourth subcapsular enucleation, the patient died of shock and toxemia. In this case the man was made comfortable and his life prolonged for five months, but we were over-sanguine and reduced the local and X-ray treatment at too early a date. No erythema of note was produced by the rays.

Case 3. *Recurrent sarcoma of the forearm. Excision. Rapid recurrence. Apparent cure under conservative treatment.*

Mrs. E. P., aged 30, no children. Has never been robust. Six years ago the patient had a curettement, ventral suspension and removal of small ovarian cyst which relieved her of dysmenorrhea. In 1901, a nodule appeared near the right elbow. Ointments were applied, but the mass progressively enlarged and finally it became painful. In October, 1905, the upper forearm had a circumference of 12 inches, and Dr. Y. extirpated the growth which was found to be a small round-celled sarcoma. In three months it recurred and was again removed by the same surgeon, and the surgeon himself gave 32 X-ray treatments, but recurrence took place while under treatment. The treatments were discontinued May 30, 1906, and amputation of the arm advised by a number of surgeons consulted. The patient was first seen by Dr. Babcock, October 15, 1906. There was a soft, fluctuating sub-

Fig. 1. Case 3. Recurrent sarcoma of scapula after two operations. Before treatment.

Fig. 2. Case 3. Increase in necrosis, ulceration and cachexia. After daily treatment with X-rays for two months.

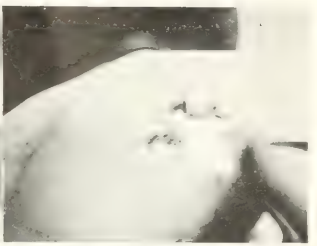


Fig. 3. Case 3. Four months after subcapsular enucleation of the degenerated tumor mass, and subsequent radiations.

cutaneous mass the size of an egg on the outer side of the right elbow, a second mass adjacent to the brachial artery and surrounding the median nerve just below on the anterior surface of the forearm. These tumors were enucleated without dividing the artery or nerve. The growth was chiefly from the fascial planes and periosteum of radius and had destroyed the upper portion of the external muscle group of the for arm. Two weeks after the operation there were distinct signs of recurrence. The patient was referred to Dr. Pfahler, November 5, 1906. Methylene blue was used locally and the daily X-ray treatments of about twenty-five minutes duration given. In ten days there was a diminution in the pain and stiffness with some improvement in the induration. At the end of a month the induration had practically disappeared, but the wound remained unhealed. At the end of five months and 32 treatments the patient had regained a healthy color, had increased in weight and was apparently well. One treatment every one to three months is now used. The patient continues in apparent health fourteen months after operation. A second, almost contemporaneous case of sarcoma, adjacent to the elbow, treated by amputation, without X-rays, was characterized by generalization and death a few months later.

CASE 4. *Round-celled sarcoma of mandible. Imperfect enucleation. Apparent recovery under conservative treatment. Rapid recurrence after extraction of a tooth.*

Miss L. G., aged 8 years. Previous history negative. First seen by Dr. Babcock, May 1, 1907. Patient was struck over left side of lower jaw three months ago. Four weeks later a nodule the size of a marble was noticed upon the external surface of the mandible near the ramus, which has grown rapidly and is now nearly the size of an egg. It is of rather firm consistency, is attached to the jaw and is free from pain or tenderness. Operation in May, 1907, the tumor being exposed and found attached to the periosteum, with perforation of the bone and communications with smaller masses in the medullary cavity. The medullary cavity was partially curetted, the tumor of soft tissues enucleated, the

Fig. 4. Case 2. Recurrent round-celled sarcoma of forearm. Photograph made two weeks after the third operation, showing recurrence.

Fig 5. Case 2. Four months later; 32 X-ray treatments.

Fig. 6. Case 5. Melanotic sarcoma of submaxillary region before operation (scopolamin-morphin narcosis).

wound painted with methylene blue solution, and daily X-ray treatment started. The patient was apparently well seven months after the operation, but had neglected treatment. A tooth was then extracted from the area adjacent to the disease, and within a week a rapidly growing mass had reappeared. Treatment resumed.

Case 5. *Melanotic sarcoma from skin of jaw. Enucleation. Conservative treatment. Apparent recovery.*

Dr. H., aged 54. Crippled from previous rheumatic attacks, otherwise he has been well. In taking down a bedstead, he hit himself a violent blow under the jaw, in March, 1905. One month later a lump was noticed in the situation of the left submaxillary gland. It was free from pain and tenderness and grew slowly until the summer of 1906, then the growth became more rapid. In May, 1907, the mass was the size of an orange, was covered by bluish veins, movable on the soft tissues beneath, and showed semi-fluctuating soft areas. It is lobular and encapsulated. Enucleated in Dr. Babcock's service by Dr. Steel, May 11, 1907. On section it is found to apparently spring from corium. The wound was painted with methylene blue, sutured, and X-ray treatment started. Apparently the patient is well seven months after operation.

Case 6. *Recurrent multiple melanotic sarcomata of posterior surface of the leg.*

Mrs. S. A., widow, aged 69. In August, 1903, the skin over the tendo-Achilles of the right leg was irritated by a shoe, and a lump the size of a hickory nut appeared, grew rapidly, ulcerated, and in 1904 was removed under local anesthesia. In 1906, the growth recurred and was injected with chemicals. Later, two other masses developed under the skin at a higher level and grew rapidly. The three growths, which proved to be melanotic sarcomas, were excised by Dr. Babcock under spinal anesthesia, March 3, 1907. The X-ray treatment began March 26th, the patient being in fair condition, although pale and rather weak, and with suspicious induration about the scar. Within a week two new nodules developed above the scar, but the induration and the new growths gradually disappeared under treatment. Methylene blue was administered internally. The patient's general health markedly improved, and nine months after the last operation the induration has almost entirely disappeared, the patient appears well and receives X-ray treatment at intervals of several weeks.

Fig. 7. Case 5. Same patient about four months after operation and post-operative X-ray treatment.

ACUTE OSTEOMYELITIS OF THE SHAFT OF THE HUMERUS. REMOVAL OF THE SHAFT. COMPLETE REPRODUCTION OF THE BONE

By CHARLES L. SCUDDER, M. D.
Surgeon to the Massachusetts General Hospital, Lecturer on Surgery, Medical School, Harvard University

THE importance of utilizing the reparative power of the periosteum in the treatment of certain cases of acute osteomyelitis of the long bones is illustrated by the following report:

The story of this case is briefly told. A glance at the legends accompanying the skiagraphs and photographs here reproduced will afford a very definite picture of the several steps in the treatment.

The patient (Mass. General Hospital number 148,047) was a girl, thirteen years old. The left shoulder had been painful, swollen and tender for two weeks. She had had fever. It had been thought that she had acute articular rheumatism. The swelling of the shoulder extended downward toward the middle of the upper arm. The child was ill. The constitutional effects of the infection were apparent. Two weeks from the onset of the sudden pain in the shoulder, i.e., on June 12, 1906, the swelling was incised through the fibres of the deltoid, evacuating a large amount of pus and

Fig. 1. Osteomyelitis of humerus. X ray appearance two weeks after the initial pain.

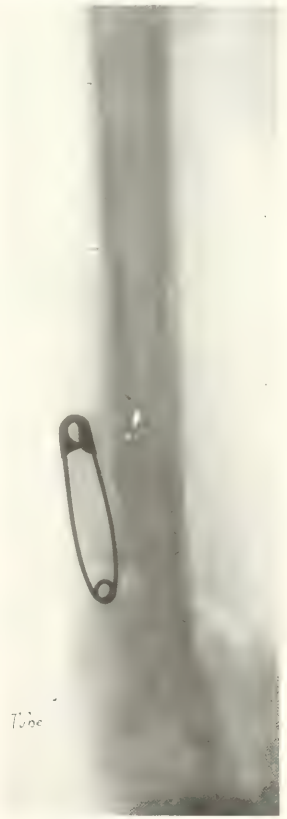


Fig. 2. Osteomyelitis. Five weeks after operation. Note proliferating periosteum and tube draining medulla.

exposing the humeral shaft at the bottom of the abscess cavity, bared of periosteum for two or three inches.

The cortex of the humerus was removed, exposing a purulent medulla (see Fig. 4). The cortex was removed until normal medulla appeared. Thus the bone abscess was thoroughly drained. The medulla was undisturbed by instruments. The medulla was gently washed with salt solution.

Fig. 4. Osteomyelitis of the humerus. Note incision outer side of upper arm, drainage tube in situ, swollen appearance of whole arm, upper end shaft of humerus projecting from wound.

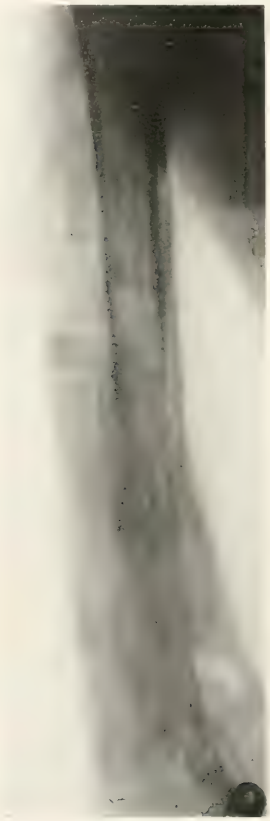


Fig. 3. Acute osteomyelitis. Seven weeks after initial operation.

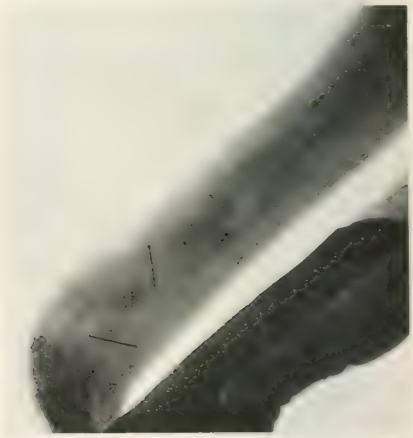


Fig. 5. Acute osteomyelitis. X-ray appearance ten weeks after the onset of the disease; eight weeks after first operation. Note lower humeral epiphysis.

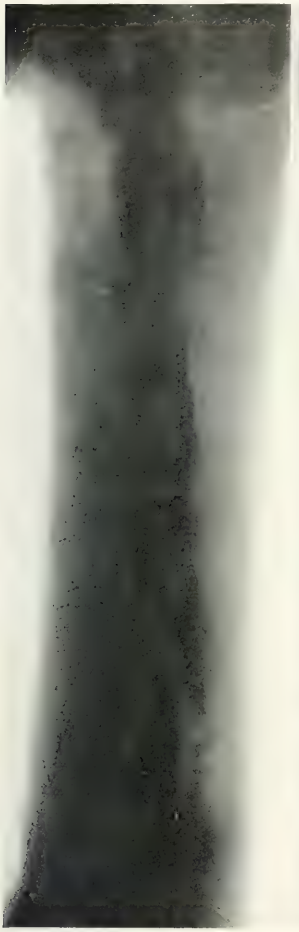


Fig. 6. X-ray. Twelve weeks after first operation.

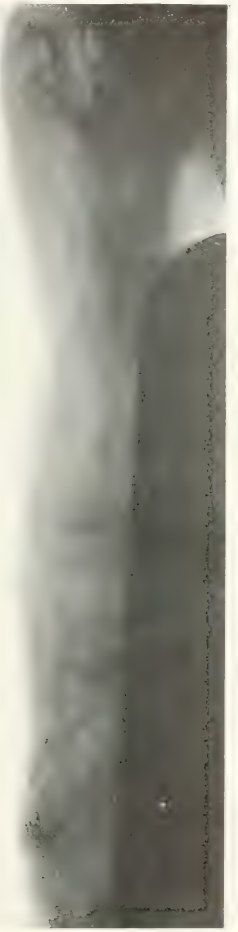
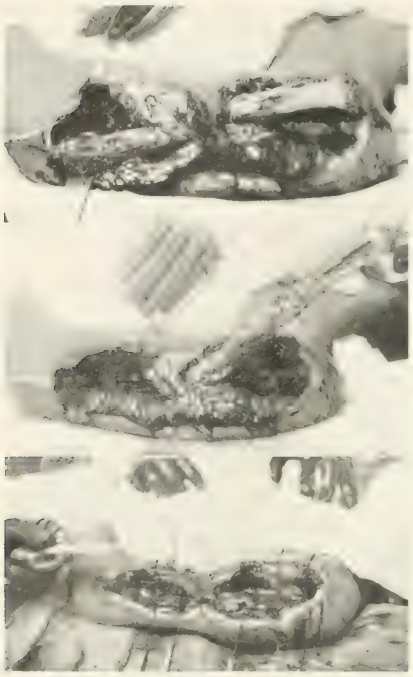


Fig. 7. X-ray. Fourteen weeks after operation.

Fig. 8. X-ray. Sixteen weeks after operation



Figs. 9 to 11. Osteomyelitis of humerus. Removal of sequestrum (shaft of the humerus) ten weeks from onset; eight weeks from first operation.

June 20, 1906. Because of pain and tenderness and swelling at the elbow, and a rather sudden elevation of temperature, an incision made at the elbow discovered conditions similar to those at the upper end of the humerus, viz., an abscess, bare bone and pus in the medulla of the humeral shaft. Drainage was instituted both of the soft parts and the bone.

July 10, 1906. The shaft of the humerus internally and externally was drained by rubber tubes (Fig. 2). A musculo-spiral paralysis appeared from the pressure of the rubber tube placed outside the shaft. This paralysis disappeared upon the removal of the shaft of the bone August 7, 1906 (see Fig. 9). Comparative X-ray observations upon the activity of the periosteum determined the opportune time for the removal of the shaft of the humerus (see Figs. 2, 3, 5). The whole shaft was removed about ten weeks after the initial symptoms and eight weeks from the first operation for drainage.

The humeral head was removed from the upper part of the wound September 10th. It was not entirely separated at the operation August 7th. The lower humeral epiphysis remained intact. Upon the removal of the shaft of the humerus the periosteal covering of the bone which had formed enough new bone (see Fig. 11), to make it easily handled, was sutured together into a ribbon by interrupted chromic catgut sutures. The periosteal layer felt about as thick and resistant as a thick egg shell (see Fig. 14). Interrupted sutures closed the more superficial wound which extended from the great tuberosity to the external condyle of the humerus. The intervals between the superficial sutures were occupied by rubber tissue drains. Buckling of the periosteal skeleton of the humerus was prevented by placing the arm upon an internal right-angled tin splint and by holding the whole upper extremity suspended in the air by bandages fastened to a cradle over the head. Thus sufficient traction upon the upper arm was maintained, while the forearm was fastened securely to the tin splint.

The progress in the formation of the new shaft was increasingly rapid (see Figs. 6-8). The patient left the hospital October 2, 1906. A small sinus remained open a short time after leaving the hospital.

At present, one year after the new bone had formed and one year and four months after the initial attack of pain, she has the use of the arm as illustrated by the accompanying photographs. There is very little motion at the elbow. There is a little motion at the shoulder. The scapula moves with the humeral shaft in most of its excursions, as indicated in the photographs. The arm is useful and strong. The functions of the forearm and hand are practically normal.

REMARKS

This was a case of virulent infection of the shaft of the humerus by the staphylococcus

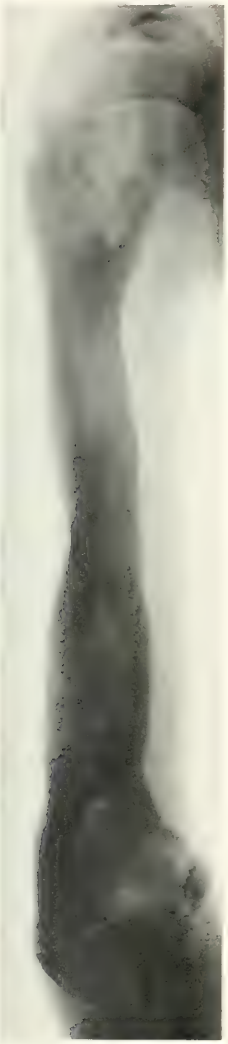


Fig. 12. Present condition of the bone as shown by the X-ray. One year and a half after operation.

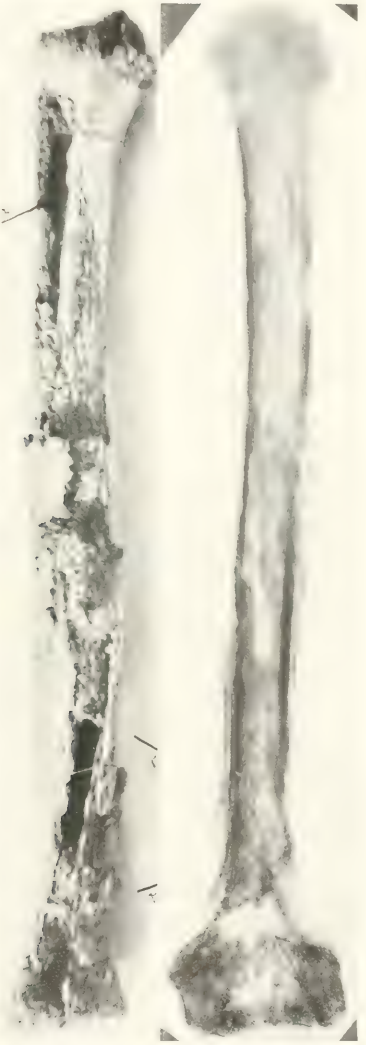


Fig. 13. Fig. 14.

Fig. 13. Osteomyelitis of humeral shaft. Photograph of bone removed. Cortical bone removed at X for drainage.

Fig. 14. Acute osteomyelitis of humerus. X-ray of humerus after removal. X-ray by Mr. Dodd

Fig. 15. Fig. 16 Fig. 17 Fig. 18

Fig. 15. Final condition of arm osteomyelitis. Removal of entire humeral shaft. Voluntary adduction. Fig. 16. Final condition of the arm after removal of entire humeral shaft. Rotation inward, backward swing and adduction. Fig. 17. Final condition of arm. Ostoemyelitis. Removal of entire humeral shaft. Adduction. Fig. 18. Final result. Removal of entire humeral shaft. Voluntary raising of arm and head.

pyogenes aureus. The entire bone suffered almost immediate death.

Drainage of the soft parts and bone resulted in a subsidence of the constitutional symptoms.

Repeated X-ray examinations and palpation of the proliferating periosteum determined the opportune time for the removal of the humeral shaft.

Attention to splinting and traction upon the upper arm prevented any deformity of the newly forming humerus.

Life in the open air and sunshine, from the moment of the first operation, hastened convalescence from the infection.

An osteomyelitis is too commonly mistaken for an acute articular rheumatism.

There is no doubt but that in certain cases of osteomyelitis much is gained for the individual by early removal of the necrotic bone. Many cases should be selected for this special method which are being treated by the delayed operation.

TRANSPERITONEAL URETEROTOMY FOR URETERAL CALCULUS[1]

BY GERRY R. HOLDEN, M. D., JACKSONVILLE, FLORIDA

IN approaching the ureter for the purpose of removing a ureteral calculus the extraperitoneal route is, for obvious reasons, almost invariably chosen. The transperitoneal route has at various times been strongly condemned as injudicious, dangerous, and unjustifiable.

While granting that the majority of cases can be easily and properly handled without opening the peritoneal cavity, it still seems that in some instances deliberate transperitoneal ureterotomy is the operation of election.

The patient, a woman 33 years old, was admitted to the gynecological ward of the Johns Hopkins Hospital (Gyn. No. 12,130) in May, 1905. On account of the absence of Dr. Kelly she came under my care. She gave a history of recurring attacks of typical renal colic on the left side for nine years before admission. For five or six months before admission there had been no acute attack, and she finally came to the hospital seeking relief from a constant dull pain in the lower left quadrant of the abdomen.

After careful study we made the diagnosis of calculus impacted in the ureter just at the point where the ureter plunges under the broad ligament, with a stricture of the ureter just below the stone. This diagnosis was based on the following observations:

[1] Read before the Southern Surgical and Gynecological Association at New Orleans, December 13, 1905.

On vaginal examination a slight thickening was felt high up on the left side. Cystoscopic examination showed that no urine came from the left ureteral orifice. A wax tipped catheter passed into the left ureter met an obstruction about 2 cm. from the bladder. As no scratch marks were left on the wax the tip had evidently not been in contact with a stone. An X-ray picture showed the shadow of what was apparently a small ovoid calculus in the course of the left ureter, approximately about 4 cm. from the entrance of the ureter into the bladder.

We concluded that probably no infection had taken place in either the ureter or kidney because during two weeks observation there was no local tenderness, no fever, and no acute attacks of pain; the leukocyte count was always normal, and the bladder urine was proven to be sterile.

Although skeptical of its feasibility we first attempted to remove the stone by the abdominal extraperitoneal route through a lateral incision. The woman was very fat and after a few moments work the impossibility of reaching the affected part of the ureter in this way became manifest. The lateral incision was therefore closed.

The patient was then placed in the Trendelenburg position, the abdomen opened in the median line, and the intestines pushed up out of the pelvis. The pelvic ureter on the left side was found to be dilated to about 2 cm. in diameter. A calculus was felt lying under the base of the broad ligament. The left tube and ovary were removed, the left round ligament cut in two, and by dissecting down through the broad ligament the lower portion of the ureter was exposed. The stone was found in the anticipated location. The uterine artery crossed over its lower third. Apparently the ureter was completely obstructed and the kidney thrown out of function.

After removing the calculus through a longitudinal incision an unsuccessful attempt to pass a ureteral catheter down into the bladder showed the existence of a very tight stricture just below the site of the impaction.

Before incising the ureter the general cavity was so walled off and the field of operation was so surrounded by gauze that the discharge of a large amount of infected urine would not have contaminated the surrounding tissues.

The ureteral incision was closed with fine silk. Extraperitoneal drainage was made from the lower end of the abdominal incision to the wound in the ureter by dissecting the peritoneum away from the abdominal wall and then passing down a strip of gauze. Vaginal drainage was also made by bringing a strip of gauze out through a puncture in the lateral wall of the vagina. Both of these drains were made extraperitoneal by losing the cut peritoneal edges of the broad ligament and reuniting the round ligament. The abdomen was then closed.

The post-operative course was uneventful. As soon as possible we began dilating the stricture with graduated ureteral catheters. It yielded readily to treatment and six months after the operation we could still pass a large size ureteral catheter. The left kidney was then secreting normally.

In this case we chose the abdominal route because it enabled us to do clean-cut surgery, working always with the field of operation in full view, with plenty of room to get at it. Moreover, we were able to examine easily and thoroughly the entire pelvic ureter, and by the hand the rest of the ureter and the kidney. Moreover, by the vaginal route satisfactory examination of the ureter and kidney above the stone and of the stricture below would have been impossible.

The site of the impaction here was higher up than we usually find in the cases of stones impacted in the lower portion of the ureter. The affected part of the ureter was not in contact with the vagina nor was it near it. It was separated from the vagina by the lower part of the broad ligament, the large vaginal plexus of veins, and the vaginal branch of the uterine artery, while in intimate contact with it above lay the main trunk of the uterine artery with its several veins. We considered that the danger associated with blind work in this location was greater than the danger from laparotomy. The removal of the left tube and ovary was regarded as a justifiable means of thoroughly exposing the lower portion of the ureter.

The danger of peritoneal infection in laparotomy we considered slight. Apparently there was no infection of the ureter, certainly no vigorous infection. Any infection which could possibly be present could be easily taken care of by proper disposal of gauze during operation and extraperitoneal drainage at the close. This extraperitoneal drainage also precluded the possibility of post-operative intraperitoneal extravasation of urine from a leak at the incision in the ureter.

As I have already stated an abdominal extraperitoneal operation was impossible on account of the thick abdominal walls.

I do not believe that transperitoneal ureterotomy for ureteral calculus is often the operation of election. I do believe, however, that it is the best operation when the stone is impacted at or just above the uterine artery, provided we are reasonably assured that infection is either mild or else absent altogether.

REPORT OF A CASE OF PUBIOTOMY[1]

BY THEO. J. DOLDERLEIN, M.D.

The history of the following case is not as complete as it should be, nor does the technique concerned present new features. There are, however, a few features, which I deem worthy of scientific interest and consideration.

Mrs. M., a primipara, was sent to my service at the German Hospital, late one evening, her physician, a very competent man, having spent most of the day and evening in the lying-in chamber. With the assistance of another physician, forceps had already been applied without avail. When I saw the patient she had very frequent and inefficient uterine contractions, a weak rapid pulse, and other evidences of exhaustion. Prompt action seemed imperative.

On examination I found the head at the pelvic inlet, semi-extended, so that both fontanelles could be felt. The promontory of the sacrum projected sharply into the pelvic cavity. The pelvic measurements were: Interspinous 21 cm.; intercristal, 24 cm.; external conjugate, 14 cm.; the true conjugate, estimated at 8 cm. The fetal heart sounds could not be heard. After careful preparation, attempt was made to flex the head. This was found impossible. Axis traction forceps were then applied with much difficulty, hoping they might guide the head around the sharp curve of the pelvic brim, but the head could not be engaged with a reasonable amount of force. Although the fetal heart sounds could not be heard, I wished to give the child a fair chance for life and, therefore, decided to do pubiotomy, rather than craniotomy.

An incision was made over the pubic bone in a sagittal line, running through the tuberculum pubicum, after the labium majus had been well drawn to the opposite side. The incision was quickly carried down to the periosteum, which was pushed aside with a Kocher's elevator. At this time there was considerable venous hemorrhage from the crus of the corpus cavernosum clitoridis, which, however, was readily controlled by pressure. The ligature carrier was then passed from below upwards, after the method of Zangemeister, and with a Gigli saw the bone was divided. The reason for passing the needle from below upwards, was convenience in this case, although Zangemeister prefers this method, because it is more apt to avoid injury to the corpus cavernosum clitoridis, and to the bladder. The child was then delivered by version.

The pelvic axis had so sharp a curve and the sacrum seemed so prominent that it was even difficult to introduce the hand. As might be expected, the child was dead, as a result of the long-continued labor and the repeated futile attempts to deliver with forceps, and the difficulties encountered in extracting the after-coming head. The wound healed per primam, save for a stitch-hole abscess. There was, however, intense œdema of the labia, and temperature of 103° on the fourth day, which shortly fell to normal. The patient was up and about in three week's time. Three months later I examined her and found perfect union, but slight tenderness over the pubic bone.

Unfortunately the weight and measurements of the child were not taken. I remember, however, that the fetus was large and presented a well-developed paniculus. The patient was 23 years old; weight, 123 pounds; had a height of four feet seven inches; had had typhoid fever, rheumatism, cerebro-spinal meningitis, a cleft palate, and indications of rickets, as was shown by deformities of head, thorax, pelvis, and lower extremities. She began to walk when about three years of age and was small and sickly throughout her childhood. She was an artificially fed baby and took the bottle up to five years.

We had then, in this case, a flat rachitic pelvis, with a well-marked sacral promontory, receding sacro-iliac articulations, and greatly increased pelvic obliquity. Edgar thus describes rickets: "The pelvis, as a whole, is undersized, having a distorted inlet, which is often kidney-shaped. The promontory of the sacrum is abnormally prominent. The obliquity of the pelvis is increased. The iliac bones are so flared that occasionally the spines are farther apart than the crests. The sacrum tends to rotate, imparting a backward impulse to the lower part, but this is offset by the firm grasp of the ligaments, and a curve thus results. The bodies of the sacral vertebræ are pushed forward at the expense of the alæ." A careful consideration of this description shows why delivery proved so difficult in our case, even though the pubiotomy gave a diastasis of 3 cm.

Although Von Cauvenberg found that on the cadaver a separation of 4 cm. at the pubis increased the diameter of the conjugate from 1½ to 2 cm., and in the living subject the increase was still greater due to the mobility of the sacroiliac articulation; Waldstein points out that in rachitic

[1] Read by invitation before the Chicago Gynecological Society, November 12, 1906.

pelves, in which the sacral prominence is extremely marked, the true conjugate is shortened rather than elongated by pubiotomy. The reason for this, I think, is obvious, inasmuch as the sacral promontory becomes more prominent as the ossa innominata are allowed to swing back on their articulations. For this reason W. Stöckel states that the operation should not be performed on pelves with true conjugates of less than 8 cm. Henkel, of Olshausen's clinic, believes, however, that the operation is applicable in flat pelves, with conjugates of 6¾ cm. or 7½ cm. in generally contracted pelves. It would appear, however, that he is not optimistic with regard to the possibilities of pubiotomy. It also appears to me that in primary cases in which there is an indisputable disproportion between the child's head and the bony pelvis, Cæsarean section is the more scientific operation. This operation should not be more dangerous than the ordinary laparotomy, and the child is saved the injurious effects of delivery through the natural passages. It is, of course, assumed that Cæsarean section should be performed only by a competent operator under proper conditions. In secondary cases, *i. e.*, in cases where long continued attempts at delivery have been made, and the Cæsarean operation is contra-indicated for obvious reasons, pubiotomy, or, if need be, any pelvic osteotomy, may be considered in preference to craniotomy.

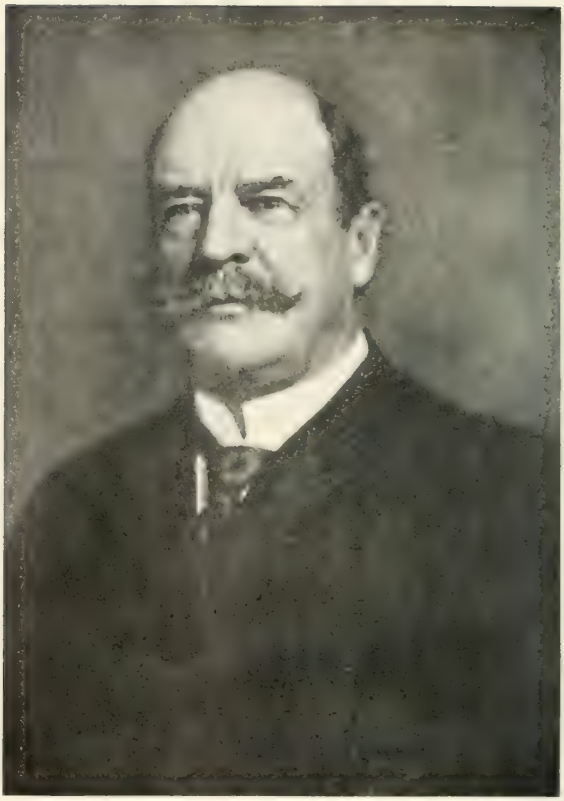
From careful study of my case another condition of the pelvis suggests itself to me, of restricting the limitation of pubiotomy, namely, ankylosis of the sacro-iliac articulation. Unilateral synostosis produces the oblique Nægele pelvis, and bilateral synostosis the Roberts pelvis; these, of course, are excluded in this case. In my case the patient had had articular rheumatism, probably of the sub-acute type, as shown by the greatly limited range of movement of the hip-joints: would it not be reasonable to believe that the rheumatism had a similar effect on the sacro-iliac joints, producing there an ankylosis? My reason for so thinking is that the pubic bones after division could be separated but about 2 cm., and there was no difficulty in holding the cut ends in juxtaposition. Other factors may have given rise to the same conditions. I wish, however, merely to emphasize that ankylosis of the sacro-iliac joint, however rare, still may be a cause why pubiotomy may fail to accomplish its purpose.

A study of the literature gives the following as to the prognosis of pubiotomy: Montgomery in 133 collected cases found no maternal deaths in the cases which were regarded as aseptic at the time of operation. (He does not mention the results in infected cases.) Gigli tabulates 100 cases without mortality. On the other hand, Frey reports 12 primary cases without mortality, and 8 secondary cases with a mortality of 50 per cent. He gave the following as causes of death: Shock, on the second day; sepsis, on the fifth day; embolism, on the eleventh day; septic phlebitis and pulmonary embolism in the fourth case. In Frey's series the infant mortality was 40 per cent. Only one death, however, followed primary operation.

In conclusion, allow me to add a few remarks as to the technique of pubiotomy: Two methods are recognized, the open and the subcutaneous. Gigli thus describes the open operation: "The incision extends from the middle line above, downward and outward beside the labium majus to the lower edge of the pubic bone, about the region of the sub-pubic tubercle. No large blood vessels are encountered. It is not necessary to dissect the tissue from the bone. The ligature carrier is then carried behind the os pubis from above downward, its course behind the bone being controlled by fingers in the vagina. A large silk ligature is now drawn through and the saw attached and drawn into place." Van de Velde, Tandler, and Zangemeister make their incisions lower, and the two latter pass the needle up from below. The subcutaneous method was proposed by Doederlein, whom I had the honor to assist in his private clinic. He punctures the skin above and below, and passes the saw around the bone by means of a specially devised needle. This method has many obvious advantages and numerous adherents. It appears to me as the simplest and safest way of severing the bone, if the patient it not too obese. When the head is pressing upon the pubis, Doederlein makes a small horizontal incision and separates the bladder by one finger introduced through the wound. Rissmann advocates drainage of the prevesical space. In extreme pelvic contracture or pre-existing inflammation, Rühl separates the bladder from the bone through the incision made in the vagina.

Pubiotomy is usually done on the side to which the occiput points. Rosenfeld holds that the pelvic increase in flat rachitic pelves is equal on both sides, after the separation of the pubis.

Pubiotomy has met with much favor in this country and abroad, and in properly selected cases, I think, has come to stay. There must always remain, however, a large proportion of pelvic abnormalities in which the operator has constantly to use conservatism and good judgment. Premature delivery must always be considered carefully in the early cases of pregnancy in contracted pelves.



JOSEPH D. BRYANT, M.D.

DEPARTMENT OF
NICHOLAS SENN FESTSCHRIFT

FRACTURE OF THE SURGICAL NECK OF THE FEMUR, WITH INVERSION OF THE LIMB

By JOSEPH D. BRYANT, M.D., New York City, New York

Knowledge is of two kinds. We know a subject ourselves, or we know where we can find information upon it. — Samuel Johnson.

THE aptness of this utterance is well illustrated by the fact, that we "ourselves," though for many years circumstanced so as to experience the opportunity, have only lately met with an instance of what we at first regarded to be the above form of injury, and therefore have sought "where we can find information upon it." And it is our special delight to submit this information as an humble contribution to the garland of respect so willingly woven by the medical profession in token of regard for Dr. Nicholas Senn.

On July 22, 1906, I was hastily summoned to consult with Dr. Kadian, of New York City, regarding a patient who had sustained a severe injury of the left hip and thigh five days before, from being "squeezed and twisted" between the long side step of a moving street car on which the patient was riding, and a heavily laden vehicle going in the opposite direction, and finally the patient was thrown to the ground, but not run over by either vehicle.

The accident happened so unexpectedly and was attended with such a degree of confusing and rapidly changing conditions that it was wholly impossible for the patient — a lusty, intelligent policeman — to give a sufficiently connected history of the affair, to be of definite utility in expressing satisfactorily the traumatic circumstances relating to the injury. It, however, appeared that immediately following the receipt of the injury the patient was taken by ambulance to a near-by hospital where, while under ether, he was subjected to an extended manipulative examination for the purpose of diagnosis, and, as the result of which, he was told that he had sustained a fracture of the neck of the femur. A little later he was removed from the general to a private hospital, where he came under my observation.

The physical examination showed the following: The left hip and thigh were badly contused at the anterior and outer aspects and were so greatly distended with extravasated blood as to render the integument tense and shiny, obliterating the topographical landmarks of these parts. The patient insisted that the increased size and distension of the limb was largely the result of the examination made under ether, and gave a history of the appearance of the limb before and immediately after the examination which could leave but

little doubt that the forcible manipulation had contributed not a little to the disturbing appearances which the part presented.

Internal rotation of the limb was pronounced (30°) and quite obstinate. The opposition to external rotation appeared quickly, increased rapidly, and the movement was arrested (not suddenly) at about the angle of 20°. The pain attending this movement (located at the upper and anterior aspect of the thigh) was marked at the beginning of the movement, increasing proportionately with the extent of outward rotation and becoming quite unbearable at the ending of the act. The injured limb was two inches and a half shorter than the other, which shortening, however, could be easily reduced to an inch and a half by means of steady manual traction. As before remarked, the distension of the soft parts about the hip and thigh with blood, together with tenderness on pressure, made impossible the utilization of the relations of the bony points in diagnosis. The injured limb was slightly flexed and could not be restored to the horizontal plane of its fellow without severe pain at the upper and anterior aspect of the thigh and by slight arching of the lumbar spine. These manifestations aroused at once a belief that dislocation of the hip might be present.

Owing to the distended condition of the soft parts of the thigh and hip and because of the increase of the general temperature (102°-F.), it was thought best not to interfere for farther diagnostic purposes at this time, but instead to make the patient comfortable pending an interview with the surgeon who had already, as it appeared, made a thorough examination under favorable circumstances, a few days before.

Accordingly, a conference was had with the surgeon on the following day, who said that the patient in question on coming under his charge had a much swollen and bruised hip and thigh with considerable pain. The limb was shortened three inches, slightly flexed and decidedly inverted, and after careful examination under ether he came to the conclusion that the patient had sustained a fracture of the anatomical neck of the femur which was attended with marked inversion. The surgeon also volunteered the statement that the medical men who were present at the time of the examination were agreed with him regarding the diagnosis.

As the result of the previous record of the case and the state of the patient it was deemed wise, for the time at least, to apply to the limb a Buck's extension, together with a long side splint, the limb being arranged, with reference to the apparatus, so as to be slightly raised from the bed and rotated firmly outward, and thus held by the means of adhesive plasters, bandages, and sand bags. In this manner the patient rested comfortably. The traction of ten pounds diminished the shortening to an inch, and five degrees more of external rotation attended the change. An increase of five pounds reduced the shortening to five-eighths of an inch and the limb to the same plane as its fellow, with slight, though painless arching of the lumbar spine. It is proper to say at this time that as the extravasated blood in the thigh lessened, external rotation

correspondingly increased during the three days which the patient was under my observation, and for this period external rotation was not decidedly arrested, but instead was gradually obstructed, as though slowly wound up by the presence of some generally restraining agent, which was regarded to be the extravasated blood lying throughout the muscular planes of the thigh.

At this time the patient passed from my observation, not again being seen by me until the middle of November.

On my departure from the city the question of fracture of the anatomical neck of the femur with inversion (as decided by the surgeon who had examined the injury under ether a few days before) or dislocation were in mind, the former (because of the examination) seeming to me the more likely.

It was determined that the injury should be at once subjected to the diagnostic scrutiny of X-rays, and that further consultation should be solicited in the event of a consequent need for it.

As I had not seen a case of fracture of the neck of the femur with inversion, it was determined to cause the literature of this form of injury to be searched during the summer, in order to report the information thus gained as soon as possible in the fall. Accordingly, under my direction, my assistant, Dr. Wm. M. Ford, took the matter in hand, with the following results.

The search directed to the published cases was made along the following lines of inquiry: The name of the surgeon; sex of the patient; the location of the seat of the fracture, *i. e.*, whether intra- or extracapsular, and the condition of the parts; history of the case; results, died with autopsy; unimproved, cured, result not stated, those cases "discovered" on autopsy, remarks, and the bibliography. The names of the surgeons and the sex of the patient were introduced in order to identify the respective cases and the sources of information relating to them. The location of the seat of fracture was made a part of the record, so that inferences might be deduced relating to the abnormal anatomical evidences suggestive of the peculiar deformity which attends them, and for the same reason the peculiar state of the capsule of the joints is recorded in the respective fractures; also the relation of the capsule to the seat of the fracture, *i. e.*, intra- or extracapsular. The tabulated history of the cases might also point to a method of injury which would prove enlightening in the estimating the peculiar effect of the injury. The results, especially as related to autopsy, are of significance because of affording the opportunity to study any peculiar arrangement of the injured parts, looking to the cause of deformity. The bibliography is necessarily extended and can be readily reviewed, should one care to make the attempt.

Patient and painstaking search has resulted in the reporting of forty-four cases of fracture of the neck of the femur (see table), with inversion of the limb. Of this number fifteen were intracapsular fractures, eighteen extracapsular, and in eleven the seat of fracture was not stated. In thirty-three a history was given. (The histories of the cases are omitted, for to include them would increase impracticably the length of the paper.) In eleven no history

was found. In twenty-six of the forty-four cases autopsies were made, and are a part of the history of these cases. In twenty-one instances autopsy was a part of the immediate history; in five, only a part of remote record. In these five of the total number of cases (44) the condition of fracture was described on autopsy, no previous history of these cases being found. Of the remaining eighteen cases, four are said to have been cured (?), and in thirteen the final result is not stated. Of the fifteen intracapsular fractures, eleven autopsies were made; and of the eighteen extracapsular fractures, fifteen autopsies were made — making twenty-six in all. A comparison of the various opinions based on academic reasons and those founded on autopsy findings relating to the causes of inversion of the foot in certain fractures of the neck of the femur, is rather more interesting than instructive.

SOME REASONS FOR INVERSION

The reasons of various surgeons regarding the cause of inversion of the foot in fracture of the neck of the femur. The numbers attending the names refer to the main chart and bibliography immediately following. The reasons are divided into academic and those based on observation and autopsy.

ACADEMIC REASONS

Brewer (1): Inversion may be present at first, due to the direction of the fracturing force. Says that it is rare.

Bryant (2): Inversion is "due to the direction of the fracture of the bone and of the fracturing force."

Ross & Carless (3): State that it is probably due to violence directed from behind forward, and to impaction of fragments. Regard the condition as being rare.

Albert (4): Due to anomalous fracture of bone.

Dupuytren (5): Attributes the inversion to the relative position of the fragments.

Brun (6): Suggests that simple fracture above or below the lesser trochanter or a simultaneous fracture of the neck and "introchanteric" region may cause inversion.

Goyraud (7): Believes that the lower fractured surface slips behind the head of the bone, thus throwing the great trochanter forward; thus the neck is clamped between the capsule and the head of the bone and is fixed in place by the gluteus medius.

Lonsdale (8) & Moullin (9): Believe inversion is due to locking of the fragments "within one another" by the force that produces the fracture. Lonsdale adds: "Another cause not unlikely" is for the upper end of the shaft to be driven through the capsular ligament, in such a manner that it can not be turned outward until extension is made. This form of injury is rare.

1. Text-Book of Surgery, 1903. Brewer.
2. Practice of Surgery, 1884. Thomas Bryant.
3. Manual of Surgery, 1905. Ross and Carless.
4. Lehrbuch der speciellen Chirurgie, 1898. Albert.
5. Principles and Practice of Surgery, 1853. Pirrie.
6. Clin. Chirugie, 1844, vol. 1. Nelaton.
7. Lehrbuch der Chirurgie, 1874, 7th ed., vol. ii. Bardeleben.
8. A Practical Treatise on Fractures, 1838 (London). Edw. F. Lonsdale.
9. Mansell Moullin, 1895, 3rd ed.
10. { Science and Art of Surgery, 1860. Erichsen.
{ Principles and Practice of Surgery, 1878. Ashhurst.

Erichsen (10): Believes inversion is caused (at least in some cases) by temporary paralysis of the external rotators.

REASONS BASED ON OBSERVATION AND AUTOPSY

Direction of Force

Grieg (11) & Smith (12): Inversion is due to the displacement of the lower fragment in front of upper.

Powers (13): Says, "It would appear that the direction of the force which produced the fracture was that most likely to impel the external fragment in the anterior direction — the very position which it occupied with regard to the superior or internal fragment,— and thus determine the inverted position of the limb."

Periosteal Bands

Ozenne (14): Says, "The persisting band of periosteum at the lower border of the neck and the peculiar character of the break were doubtless responsible for the inversion."

Pirrie (15): Says, "I believe that the integrity and tension of the ilio-femoral ligament was the cause of the adduction, flexion and inversion of the limb." Occurs occasionally.

Interposition of Bone

Linhart (16): Believes that the commonest cause of inward rotation is the interposition of one fragment of bone between two others, as seen in his case.

Muscular Action

Fayrer (17): Thinks that in his case inversion was mainly due to muscular action.

Guthrie (18): Considers it probable that the inversion arises from a diagonal fracture through the trochanter major, so that the gluteus medius and minimus with the tensor vaginæ femoris draw the thigh bone forward and rotate it inwards.

Burns (19): Inversion "is readily explained by the bruising and resulting incapacity of the external rotators. But inversion may occur in intracapsular fracture when the same explanation may hold good, although a number of others have been offered."

NOTE

Bevan (20) & Malgaigne (21): Each offer extensive explanations which were not included in the foregoing.

The infrequency of this variety of manifestation of injury is emphasized by the fact that Agnew, Boyer, Cloquet, Louis, Nelaton, Sabatier, and many others of extended observation never had had their attention directed to a case of this kind. According to Ashurst, it "has been observed;" to Bardeleben,

11. Edinb. Med. J., vol. xl, Part II, 1895. David M. Grieg.
12. A Treatise on Fractures in the Vicinity of the Joints and on Certain Forms of Dislocations, 1854 (Dublin). Robert William Smith.
13. Dublin Medical Press, 1861. J. H. Powers, F. R. C. S.
14. Le Prog. Méd., 1877, V. Ozenne.
15. The Lancet, 1879, vol. i (London). William Pirrie.
16. Oesterr. med. Wochenschr., 1845, No. 18. Linhart.
17. Clinical and Pathological Observations in India, 1873. J. Fayrer, C. S. I., M.D., F.R.S.E.
18. { A Treatise on Fractures, 1859. Joseph François Malgaigne.
    { A Treatise on Fractures, 1844. Astley Cooper.
19. Principles of Surgery, vol. i, 1838. John Burns.
20. Dublin Q. J. M. Sc., vol. x, August and November, 1850. Article xi, Philip Bevan.
21. A Treatise on Fractures, 1859 (Philadelphia). Joseph François Malgaigne.

it "occurs with great rarity;" and to Sir Astley Cooper, it is "extremely rare." In sixty cases of fracture of the neck of the femur, Cloquet did not see inversion of the limb. Linhart, Pirrie, Tillmanns, and Wyeth regard it as being very infrequent. Benjamin Bell, B. Cooper, Wharton, and Curtis do not mention the presence of such deformity in fracture of the neck of the femur.

In conversing, at different times, regarding this variety of deformity, with surgical colleagues of extended experience, many have disclaimed having seen a case, others are uncertain, and a very few regard it as being not uncommon. I have a notion that this deformity in fracture of the neck of the femur is so rare as not to have attracted attention, except, perhaps, in such a disjointed way as not to invite continuous thought concerning the matter.

It is not needful that the author shall assign reasons for the deformity which in his case prompted the searching of the literature relating thereto, since but casual reading of the following outcome of the case will alone account for the inversion without the exercise of a present imagination or the utilization of a past experience.

> 'Tis but to know how little can be known,
> To see all others' faults and feel our own.
> ALEXANDER POPE.

On returning from the country about the first of October, at once Dr. Kadĭan was communicated with regarding the case in question. It appeared that soon after my departure, early in the summer, the patient sustained an acute and somewhat protracted attack of lobar pneumonia which made it impossible for the employment of special means in diagnosis, and also that the time was nearly all consumed in attention to the immediate demands of the patient, irrespective of the injury itself. At once, however, the patient was placed in the hands of Dr. Cauldwell, a well-known expert in X-ray matters. He reported that the patient had dislocation of the head of the femur on the dorsum ilii, complicated with fracture of the brim of the acetabulum. That the femur was dislocated, an examination of the patient at this time readily disclosed. It was not quite certain, however, that I could find on the negative any evidence of fracture of the brim of the acetabulum, as was confidently expressed by Dr. Cauldwell. The presence of bony crepitus so certainly experienced by the surgeon who first examined the patient, aided by the effect of anesthesia, served to emphasize the probability of the correctness of Dr. Cauldwell's opinion regarding fracture of the brim of the acetabulum. It is proper to say at this time that Mr. Mason, the distinguished photographer of Bellevue Hospital, confirmed the opinion of Dr. Cauldwell after a careful examination of a negative made by himself while the patient was in the Hospital. Believing that the presence of this fracture might account largely for the ability to reduce the shortening of the limb to less than three-quarters of an inch at the time of first meeting with the patient, and also account for the bony crepitus discovered by the examination made in the first instance, and possibly opportunity in reducing the dislocation, it was determined at

once to make the trial at the earliest time. Accordingly the patient was anesthetized, and earnest and continued efforts were made to overcome the dislocation, but without effect. In a final trial, however, attended with increased effort, the neck of the bone was fractured. This accident, however, was not regarded as a special misfortune, since it permitted of a much better adjustment of the limb, which could then be reduced to within an inch in length of the normal limb and with the alignment of the foot and thigh in proper relation to the opposite one. The patient remained in the hospital in bed under common treatment for fracture, without special pain, the usual length of time and was discharged with an inch shortening, and otherwise was not unusually afflicted by reason of the displaced head of the bone.

Veritatis simplex oratio est.—SENECA.

BIBLIOGRAPHY OF 44 CASES OF FRACTURE OF NECK OF FEMUR WITH INVERSION, NUMERICALLY ARRANGED

CASE 1. Observations on the treatment of fractures of the upper third of the thigh bone, 1828 (London). Joseph Amesbury.

CASE 2. Observations of the treatment of fracture of the upper third of the thigh bone, 1828 (London). Joseph Amesbury.
A treatise on fractures, 1844 (Philadelphia). Astley Cooper.

CASE 3. Observations on the treatment of fractures of the upper third of the thigh bone, 1828 (London). Joseph Amesbury.

CASE 4. A treatise on fractures, 1844 (Philadelphia). Astley Cooper.
A practical treatise on fractures, VIII edition, 1891 (Philadelphia). Frank Hastings Hamilton.
Med. Chir. Trans., vol. xiii, 1827 (London). George Langstaff.

CASE 5. A treatise on fractures, 1844 (Philadelphia). Astley Cooper.

CASE 6. A practical treatise on fractures and dislocations, VIII edition, 1891 (Philadelphia). F. Hastings Hamilton.

CASE 7. A practical treatise on fractures and dislocations, VIII edition, 1891 (Philadelphia). F. Hastings Hamilton.

CASE 8. A practical treatise on fractures and dislocations, VIII edition, 1891 (Philadelphia). F. Hastings Hamilton.
Columbus (Ohio) Med. J., Nov., 1882. W. J. Conklin.

CASE 9. A practical treatise on fractures and dislocations, VIII edition, 1891 (Philadelphia). F. Hastings Hamilton.

CASE 10. A practical treatise on fractures, 1838 (London). Edw. F. Lonsdale.

CASE 11.
CASE 12. } A treatise on fractures, 1859 (Philadelphia). Joseph François Malgaigne.
CASE 13.
CASE 14.
CASE 15.
CASE 16.
CASE 17. } A treatise on fractures in the vicinity of the joints and on certain forms of dis-
CASE 18. } locations, 1854 (Dublin). Robert William Smith.
CASE 19.
CASE 20.
CASE 21. } A treatise on fractures, luxations and other affections of the bones, III edition,
CASE 22. } 1817 (Philadelphia). Pierre Joseph Desault.

Number of Case	Surgeon	Patient's Sex	Position of Tumour: Intracranial	Position of Tumour: Extracranial	Position of Tumour: Not Stated	Vertigo: Present	Vertigo: Absent	Vertigo: Not Stated	Size of Tumour	Position of Lesion: Recurrent Laryngeal Nerve	Position of Lesion: Left Sympathetic	Position of Lesion: Left Cervical Cord Tracts	Position of Lesion: Pyramids	Position of Lesion: Not Stated or Doubtful	Position of Lesion: Not Stated or Absent	Position of Lesion: Doubtful	Motility	Cerebellum	Position of Tumour in Relation to Mesial Plane	Deaths: Attended	Deaths: Not Attended	Deaths: Unimproved	Deaths: Operation	Deaths: Result Not Known
1.	Stanley	Male			1			1	½ inch	1					1	1				1				
2.	Gothe	Female		1		1			½ inch	1					1	1	Pain			1				
3.	Syme	Male		1		1			1 inch	1					1	1	Paralysis		Upward Forward	1				
4.	Longhurst	Female			1	1									1	1				1				
5.	Cushing	Female	1			1			+	1					1	1	Paralysis			1				
6.	Cushing	Not stated						1		1					1	1				1				
7.	Bilton	Not stated		1				1		1					1	1								
8.	W. J. Carson	Female		1		1			1 inch	1			1		1		Paralysis	½	Upward Backward	1				
9.	Hamilton	Not stated	1					1		1					1	1								1
10.	Lonsdale	Not stated			1			1		1					1	1								1
11.	Mygind	Female	1					1		1					1			1						
12.	M. Metcalfe	Not stated		1				1		1					1	1								1
13.	M. Morton	Not stated		1				1		1					1	1								1
14.	Smith	Female	1					1	¾ inch	1					1	1				1				
15.	Smith	Male		1				1	2 inch	1					1	1				1				
16.	Smith	Male		1				1	2 inch	1					1	1								
17.	Smith	Male		1		1			4 inch	1					1	1		½	Upward	1				
18.	Smith	Female		1				1	½ inch	1					1	1	Slight			1				
19.	Smith and Fleming	Female	1			1				1					1	1	Painful			1				
20.	Smith	Female		1		1			¾ to 1 inch			1			1	1				1				
21.	Desault	Female			1	1			1 inch	1					1	1			Upward Backward				1	
22.	Desault	Male			1		1			1					1	1							1	
23.	Hudson	Male			1	1			½		1		1			1	None at hip	½						1
24.	Gulliver	Male		1		1			+	1					1	1				1				
25.	Bevan	Female	1					1	½ to 1½ inch	1					1	1		½						
26.	Fayrer	Female	1			1			1 inch			1	1		1			½		1				
27.	Geier-Tempelman	Female		1		1				1					1				Upward	1				
28.	Geier	Female		1		1				1			1			1			Upward Forward		1			
29.	Wessinger	Male	1			1			1 inch	1			1		1				Upward					
30.	Erichsen	Not stated	1			1				1					1	1								
31.	Erichsen	Not stated	1			1				1					1	1								
32.	Pirrie Roberts	Female	1			1				1			1			1	Present Painful	½		1					
33.	Pirrie	Not stated	1					1		1					1	1				1				
34.	Paré	Female			1			1		1					1	1								
35.	Dupuytren	Not stated			1			1		1					1	1								
36.	Dupuytren	Not stated			1			1		1					1	1								
37.	Petit	Male			1			1		1					1	1			Upward				1	
38.	Fealdman Bennett	Not stated		1				1		1					1	1			Upward Backward					
39.	Ozenne	Female	1			1				1					1	1	Painful Slight		Upward	1				
1.	Bowles	Female		1		1			1½ to 2 inch		1		1			1	Painful Slight	½	Upward	1				
40.	Linhart	Not stated		1				1		1					1	1	Slight		Upward					
1.	Ibn Bukns	Female		1		1			+	1					1	1				1				
41.	Mosetig-Von Moorhof	Not stated			1	1				1			1			1	Slight	½						1
44.	Mosetig-Von Moorhof	Not stated			1	1				1					1	1								1
	Totals		15	18	11	14	1	20	19 Specified; 1 Not Stated	31	2	3	3		35	3	4	Painful 14; Slight 3; Not Stated 1		Upward 13; Backward 1; Forward 1	28	1	2	4	1
	Grand Total				44																			

* Something amount to : Stated. N Not stating. Cerebellum present. Cerebellum not present. U Upward. B Backward. F Forward.

...s Relating to Cases of Fracture within the Capsule	Condition of the Capsule in Intra- and Extra-capsular Fractures	Details Relating to Cases of Fracture [illegible] Capsule	Remarks Bearing on Early Appearances of the Injured Part
f neck within the capsule entirely	Not torn anteriorly.		
	Uninjured.	1. Latter to greater trochanter [illegible] from upper part of trochanter major diagonal to trochanter minor	Swelling and contusion. Limbs not of equa length by traction.
	Uninjured	1. [illegible] 2. [illegible]	
at base of cervix (presumably capsular)	Greatly thickened.	"Fracture between the two trochanters."	
oken off within the capsule			Mo[illegible]
		Comminuted fracture of shaft [illegible] ceived the whole neck.	
		1. Lesser trochanter broken off. 2. Impacted fracture through anterior and posterior intertrochanteric lines; whole neck is driven into cancellated structure of the shaft	Shortening not overcome by gentle traction.
oken off within capsule	Worn away below [illegible]		
within capsule (oblique) [illegible] nward and forward	Cervical ligament [illegible] along concavity of bone.		
		[illegible] Trochanter major and minor each broken off.	
		Neck of bone between [illegible] which constitutes intertrochanteric type together with lesser trochanter detached from shaft, comminuted and displaced.	
	Evidence of chronic rheumatic arthritis within the capsule	1. Neck of bone fractured at its base. 2. Trochanter major broken obliquely from shaft. 3. Trochanter minor broken obliquely from shaft.	Considerable swelling.
		1. Neck of bone driven into cancellated tissue of trochanter. 2. Fracture separating lesser trochanter and posterior ½ of great trochanter from shaft.	Admitted of slight eversion.
bone fractured within capsule. ts impacted.			Eversion caused pain. Inverted limb not shorter, the other fractured 20 years before.
		Neck of femur fractured external to capsule, it had been driven into the cancellated tissue of the lower fragment breaking off the entire trochanter major. Anterior surface of femur turned inwards	Effort to walk increased shortening and caused [illegible] eversion
			Rotary motion of trochanter on its axis.
			Chloroform. Limb straightened. Crepitus free motion, tendency to eversion.
		Fracture of neck at junction with shaft detaching posterior part of [illegible]	
bone absorbed. bony deposit had taken place.	Capsular ligament thickened, otherwise perfect.		Pressure on heel increased shortening 1 in. and [illegible] eversion. Rotation outward to normal.
bone comminuted, a few small de- gments of bone only remaining.	Capsule disorganized especially in front. Round lig. gone.		As patient's health failed foot became inverted
		The lower fragment in front of upper. Fracture along anterior intertrochanteric line. Posteriorly a large fragment had been detached, including the lesser and ¾ of greater trochanter; some comminution	
			Shortening not overcome by extension.
femur fractured close to ball of dane of fracture at right angles to of neck. Round ligament entire	Capsular and ileo-femoral ligament entire.		External rotation caused great pain. Plaster applied. Result. No inversion. No eversion [illegible]
ls of autopsy	No details of autopsy.		
			Great troch. 4 fingers' higher than it ought to be. Ext. rotation no resistance.
		Trochanter major dislocated upward and backward after fracture and united to shaft of bone imperfectly.	
oblique" fracture of head and eriosteum not torn below.	Capsule intact.		Could raise heel from bed. Motion aggravates pain in hip. Abduction and adduction possible
	Synovial membrane uninjured.	1. Great and lesser trochanters are both completely detached from shaft. 2. Neck is fractured obliquely downwards and outwards 3. Six or seven fragments including all pieces	Slight movement caused great pain. After a [illegible] with increased [illegible]
		The epiphysis of thigh broken into 3 fragments. 1. External fragment represented the large posterior aspect of trochanter major and represented head of bone, most of the epiphysis and trochanter minor. 3rd fragment was the anterior fragment of trochanter major	"Limb could not be rotated outward, only as far as straight position."
		1. Neck broken across its root. 2. Posterior part of trochanter also broken off (presumably great trochanter). 3. Trochanter minor detached and drawn upwards and forwards.	
			[illegible]

Case 23. Pac. Med. & Surg. J., vol. iv, June, 1870-May, 1871. A. S. Hudson.
Case 24. Edinb. Med. & Surg. J., vol. xlvi, 1836. George Gulliver.
Case 25. Dub. Q. J. M. Sc., vol. x, 1850. Philip Bevan.
Case 26. Clinical and Pathological Observations in India, 1873. J. Fayrer, C. S. I., M. D., F.R.S.E.
Case 27. } Edinb. Med. J., vol. xl, Part II, 1895. David M. Grieg.
Case 28. }
Case 29. The Med. Age, vol. i (Det., Mich.). J. A. Wessinger.
Case 30. } Science and Art of Surgery, 1873 (Philadelphia). John E. Erichsen.
Case 31. }
Case 32. } Lancet (Lond.), 1879, vol. i. William Pirrie.
Case 33. }
Case 34. Lond. Med. & Surg. J., vol. i, 1832. Baron Dupuytren.
A practical treatise on fractures, 1838 (London). Edward F. Lonsdale.
Case 35. } Lond. Med. & Surg. J., vol. i, 1832. Baron Dupuytren.
Case 36. } Clin. Chir., vol. i, 1839. Dupuytren.
Case 37. A treatise on diseases of the bones, 1726 (London). John Louis Petit.
Case 38. Vrtljschr. f. gerichtl. Med., 1904, xxvii. Feldman.
Case 39. Progrès Méd., Par., 1877, V. Ozenne.
Case 40. Dub. Med. Pr., 1861. J. H. Powers.
Case 41. Oesterr. Med. Wochenschr., 1845, No. 18. Linhart.
Case 42. Principles of Surgery, vol. i, 1838. John Burns (case).
Case 43. } Ber. d. k. k. Krankenh. Wieden für 1874, Vienna, 1875. Mosetig von
Case 44. } Moorhof.

DEPARTMENT OF TECHNIQUE

FRACTURE OF THE FEMUR IN FORCIBLE DELIVERY WITH PRESENTATION OF A SPLINT[1]

BY CHARLES R. ROBINS, M.D., [illegible]
Professor of Gynecology, Medical [illegible]

The possibility of fracture of the femur in the various manipulations of the lower extremities in forcible delivery is referred to in a few of the standard books on obstetrics. So far as I have been able to ascertain, after a somewhat careful investigation conducted by myself and others, this is the most that is given on this condition in medical literature.

It was my misfortune to have this accident happen in a case conducted by myself, and in discussing it with several local physicians I was able to learn of five other cases. When the amount of strain which has frequently to be placed on these small bones is considered, we would readily conclude, what appears to be proven by the very meagre inquiry conducted by myself, that this accident is by no means as infrequent as the slight attention paid to it would indicate. As regards treatment, I have been unable to find any suggestion of any method, and yet the difficulties presented are quite serious.

In the case which I have to report, the presentation was by the breech, the spine lying left anterior. The mother had been in labor two days and had only been able to bring the breech to the lower strait of the pelvis when she became completely exhausted and the pains of no avail. It therefore became necessary to deliver by traction, and I called in my colleague, Dr. D. J. Coleman, professor of obstetrics, who agreed as to the necessity for this step and suggested that as the groin could be reached, that traction should be made by the finger hooked over the anterior groin. While this was being done the femur suddenly snapped. Delivery was completed without further accident than a slight laceration of the perineum.

In the treatment of such a fracture a number of points must be considered. It is absolutely necessary to adopt some method that will permit handling of the child for nursing without disturbing the limb, that will permit changing of napkins, that will not become soiled and that will not excoriate the delicate skin. These indications cannot be met by any of the methods in vogue for treatment in older persons. The following methods were considered and discarded for various reasons:

Fig. 1. Splint with binder and hammock attached.

The long lateral splint is not satisfactory even in adults because it does not prevent angulation and shortening. It would be extremely difficult to fix the fragments of the femur encased in soft thick muscles.

The Bradford frame might be used with bands placed to fix the limb, but it holds the limb in extension, which is abnormal in infants and must result, for obvious reasons, in extreme angulation.

Buck's extension cannot be applied to such a small individual, and the child cannot be moved for nursing at the breast.

Fig. 2. Splint applied to infant.

[1] Read before the Southern Surgical and Gynecological Association of New [illegible]

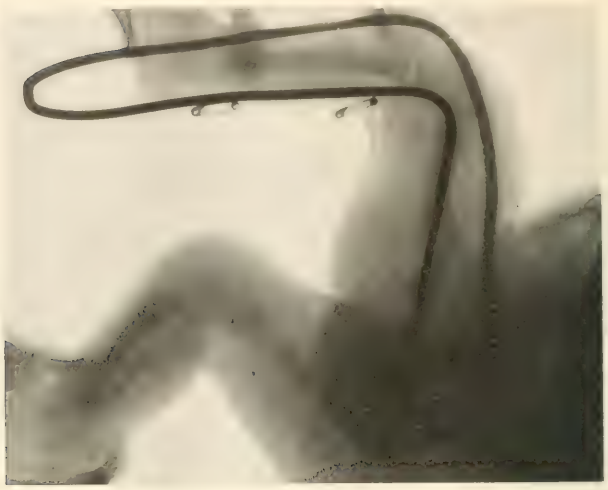


Fig. 3. X-Ray showing fracture in case reported and splint applied.

Vertical extension would prevent handling or nursing at the breast.

Plaster of Paris is heavy, apt to become soiled, and to excoriate the skin and would be extremely difficult to apply in an infant to produce a satisfactory result.

Some method then to which these objections could not apply and which would meet the various indications became necessary, and the splint which I present and which is the one used in the case reported, was the final result of my efforts. It is simple, easily constructed, and yet I think meets every indication.

It is made of stout wire, such as is used on the street for telephones, and while it can be bent with pliers, is sufficiently rigid to keep its shape. A splint should be constructed for each case so as to conform to the proper measurements. In constructing it, it passes across the back at the level of the lower angle of the scapula, commencing on the sound side. It is then bent to run along the posterior lateral aspect of the body to the great trochanter on the affected side, then bent upward to correspond to the line of the femur, the thigh being bent at little more than right angles to the body, which is the natural position for an infant and which at the same time secures the greatest relaxation of muscles and best apposition of fragments, and then carried to just above the knee, then bent in a horizontal direction and carried about two inches beyond the foot, when it is curved around and brought back on the inner side of the leg in a loop until it reaches the knee, when it is bent outward to pass in front of the sound thigh and to extend to the posterior lateral line of the body just above the anterior superior spine, and then bent along this line and carried to meet the end of wire commencing the splint.

The splint is fixed to the body with a binder of stout canton flannel which is made double at the back so that that portion of the splint may be slipped between the folds. It should fit snugly, and the binder is kept from slipping off the splint by adhesive plaster which adheres to the binder and is continued around the bar of the splint, one on either side. The binder is fastened in front with safety pins. This gives a very firm and satisfactory base for the splint. The leg rests between the bars of the loop bent around it and is supported by a hammock made of canton flannel. This is sewed over the bar on the inner side, the outer side being left free and fixed over the outer bar with small safety pins. The hammock is adjusted so that when the leg is held firmly in it, which is done with a roller bandage, there will be some traction on the femur. When it becomes slack it can be easily tightened and repinned. The up and down motion of the knee can be prevented

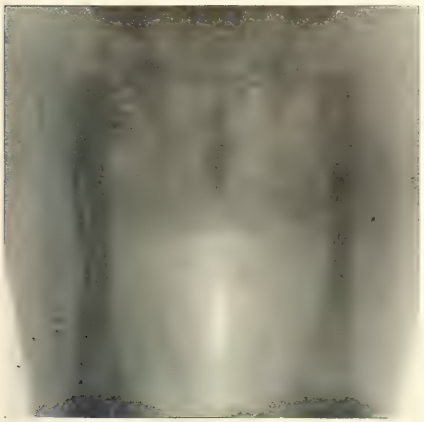


Fig. 4. X-Ray showing result at age of 6 months. The over-riding shown in Fig. 3 was completely reduced and the two limbs are identical.

by bands of adhesive plaster passed before and behind the thigh and attached to the vertical bars of the splint. Coaptation splints are difficult to use and inefficient. In actual practice I found the splint as described light, it did not excoriate the skin or become soiled, the only point of pressure was at the tranverse bar running across the back, and this was prevented by padding with absorbent cotton. The child was easily handled and nursed and was able to take its airing.

The result secured was perfect as regards function, and anatomically without angulation or shortening. A radiograph taken after the splint was applied, showed a slight over-riding but perfect alignment of the femur, and another taken at six months shows a femur without angulation or deformity of any sort.

I was anxious to compare this result with other methods and had radiographs taken of two cases, one of which had received no treatment and the other treated with apparatus. Both showed marked angulation and deformity, although function was excellent in the case treated with apparatus.

RÉSUMÉ OF SOME RECENT LITERATURE OF PUBIOTOMY[1]

BY HENRY F. LEWIS, M.D.

HISTORICAL

Gigli, in 1893, after seeing and studying many cases of symphyseotomy, conceived of the lateral incision through the pubic bone as an improvement which obviated many difficulties and dangers of the older operation. Following his ideas, Bonard of Lugano performed such an operation in 1897 without anesthetic and in a mountain hut under most unfavorable auspices, but with excellent results. Calderini of Bologna did a second operation in 1899. Van de Velde of Haarlem performed the third pubiotomy in 1901. The results of both were good. It was not until 1902 that Gigli had his first chance to himself do his own operation. This is the first of a series of 15 cases in Italy which Gigli reports in the *Zentralblatt für Gynekologie* of 1904. Since then Van de Velde has done 2 more, Mayer of Copenhagen 1, Meurer of Amsterdam 1. All of the results were good, every patient left her bed within one month.

Gigli and the Italian obstetricians were not entirely borne out in their enthusiasm for pubiotomy by later reports of the operation done elsewhere in Europe. Everke, in the *Zentralblatt* for 1906, prophesies that hebotomy will soon pass, as did symphyseotomy. In 1900 Baumm of Breslau performed two pubiotomies according to Gigli's open method, with fatal results in both cases. This so disgusted him with the operation that he performed no more until 1905 when he began again, this time following Doederlein's subcutaneous method. Baumm reports 10 cases since the latter date. He had no maternal deaths, but concludes that pubiotomy has not been proven to be an operation to be recommended for general practice, and that if it is to be justified, special skill must be obtainable and employed.

TECHNIQUE

Gigli (Z. f. G., '04, p. 1397) gives his technique of the lateral incision. He says that hebotomy is now so perfected that symphyseotomy is no longer a surgically correct procedure. The only danger of hemorrhage is from the crus of the clitoris, and this usually yields readily to tamponade

[1]Read at the Chicago Gynecological Society, November 15, 1907.

and pressure. There are two important points to be observed: first, the cut must be outside the articulation of the symphysis; second, it must be outside the insertion of the ligamentum pubovenicula. It lies entirely in bone instead of fibrocartilage. The external incision may be guided by the index finger and thumb of the left hand placed respectively above and below the symphysis. The knife passes to the right of these digits. One may cut freely and fearlessly. The blunt needle is inserted behind the bone and passed close to it under the guidance of two fingers in the vagina. The wire saw cuts through the bone, and the operation is finished.

Doederlein (*Archiv für Gynekologie*, B. lxxii) describes his subcutaneous method. A small incision is made over the pubic tubercle on one side, usually the left. A blunt, curved needle of special design is passed along the posterior surface of the bone, guided by a finger passed into the wound. It is passed out through a small counter-opening in the labium majus. The Gigli saw is drawn through and the bone severed. The skin wounds are sutured without drainage. Doederlein recommends the prophylactic insertion of the saw in cases of narrow pelvis where the outcome is uncertain, especially in breech cases and those where version is likely to be required. The subpubic ligament must be cut in order to get sufficient parting of the ends of the bones.

Sellheim says that in Doederlein's method ocular inspection and exact hemostasis are sacrificed. In each case there is considerable hemorrhage from the ends of the bones and there is usually a hematoma of the labium.

Leopold and Kannengieser (Z. f. G., '04) report 5 cases. The first was by Gigli's open method and the last 4 by Doederlein's. All mothers had a quick and normal recovery. Leopold concludes favorably to the operation.

Walcher and Bumm puncture the skin with the needle and pass it without the guidance of the finger, as Doederlein does, but with a finger in the vagina.

Baumm, on the basis of his 10 cases, concludes that Doederlein's subcutaneous method renders the open method of Gigli obsolete.

Of 294 cases collected from the literature by Doederlein (1906 Congress German Gynecological Society) 77 were treated by the open method. These had a maternal mortality of 10 per cent. The remainder were treated by the subcutaneous operation and showed a mortality of 4 per cent. Deaths were from infection, thrombosis, and hemorrhage.

Reifferscheid describes a fatal case of wounding the bladder by means of the needle. Henkel recommends stripping up the posterior periosteum before passing the needle.

Several authors propose or practice methods of keeping the pelvic girdle enlarged permanently after the operation so that future labors may be easier. It is well known that this is the rule in symphyseotomy, indeed, this is one point that is often used as a reason against the operation. Since few observers prove that there is a bony union even in pubiotomy and nearly all who have studied that point state that there is a space between the bony ends filled with fibrous tissue, it would seem that the operation done in the customary manner provides for a permanent enlargement of the pelvis. Credé proposes a pelvio-plastic operation which places a piece of the bony pelvis between the divided ends of the bone. (Z. f. G., '06, No. 22.) The skin is opened by an incision of semicircular shape passing from the right pubic tubercle across the hypogastrium to the middle of the horizontal ramus of the pubes on the left. The skin is turned down to expose the bone. The wire saw is passed first in the Gigli manner. Then it is passed into the obturator foramen, and that aperture is joined to the first bony incision by the saw. From the point where the saw entered the obturator foramen it is again passed to a point on the upper surface of the horizontal ramus two centimeters to the left of the original bony incision. Thus a square piece of bone is separated from the pubic structure. This is pushed down between the separated ends of the lower portion of the pubes, to be allowed to grow there and increase the caliber of the pelvis by so much.

Truzzi and Wendeler propose to introduce foreign substances, such as magnesium or ivory, into the space between the bones (Z. f. G., '06, No. 37, and '07, No. 21).

Hammerschlag proposed to introduce a piece of bone and periosteum from the tibia into the cleft between the bone ends (Z. f. G., '07, No. 24). Schikeles (Z. f. G., '07, No. 24) makes a triple cut in the bone and unites the ends *a* and *b*.

RELATION TO SYMPHYSEOTOMY

Sarwey collected statistics comparing hebotomy, symphyseotomy, Cæsarean section, and premature artificial labor, with the following results:

Hebotomy on a basis of 120 cases had a maternal mortality of 2.5%

Symphyseotomy on a basis of 210 cases had a maternal mortality of 12.8%
Cæsarean section on a basis of 207 cases had a maternal mortality of 6.3%
Artificial premature labor on a basis of 2,200 cases had a maternal mortality of 1 4%

Doederlein concludes that hebotomy has enough advantages to be preferred to symphyseotomy, holding that the usual hematoma of the vulva in the former rarely has serious results.

Sellheim (Monatsschrift für Geburtshilfe und Gynekologie, '06) gives a résumé of his own clinical and experimental studies of hebotomy and symphyseotomy. He finds the same safety of the sacro-iliac joints in both. The former fear that excessive separation of the symphysis might cause injury to the sacro-iliac synchondroses has been proved ungrounded. Sellheim found that no damage came to these structures unless the anterior ligaments were divided, and no possible force in nature could tear these ligaments asunder. There was the same permanent opening between the divided extremities of the pubes in both, because in all cases in his experiments the union was only fibrous.

E. P. Davis had an experience of 8 cases of symphyseotomy. He concludes that the results are less favorable for mother and child than those of Cæsarean section. From his studies of the literature of symphyseotomy and pubiotomy he has not been led to perform the latter.

Gigli states that in Pestalozza's clinic in Florence, where symphyseotomy and hebotomy were done contemporaneously, the results of the former operation were uniformly worse than the latter. They had a longer convalescence, while the latter healed with ease. Symphyseotomy is an operation on a joint, a pubic arthotomy done during labor. Gigli has the temerity to compare such an operation with an operation upon such a joint as the knee. Indeed, throughout all of Gigli's writings and those of the Italians in general there is such a marked partisanship displayed that their conclusions as to pubiotomy and its relative value must be taken cum grano salis.

Frey performed 3 symphyseotomies and 5 hebotomies at Mühlhausen. The results may be tabulated as follows:

1. Symphyseotomy, no laceration of consequence.
2. Symphyseotomy, urethra torn across.
3. Symphyseotomy, much hemorrhage; perfect final result.
4. Hebotomy (open), large tear of anterior vagina, causing complete incontinence.
5. Hebotomy (open), perfect result.
6. Hebotomy (subcutaneous), insufficient opening of the bones, child dead, anterior vaginal tear, recovery.
7. Hebotomy (subcutaneous), perfect results.
8. Hebotomy (subcutaneous), insufficient opening of bones, living child, good final result.

Schauta became a convert to the Gigli operation. He states that the main advantage of hebotomy over symphyseotomy is the avoidance of extensive wounds of the soft parts. His optimism in regard to the Italian operation is not well borne out by numerous reports of extensive lacerations following it.

Zweifel in Germany has always been the strongest advocate of symphyseotomy. Up to 1899 he had 35 cases without maternal death. In the next 11 he had 4 maternal deaths. In the whole series he had only 4 deaths of the children.

DANGERS

Abel's work in symphyseotomy shows that the healing process of the soft parts has a greater influence upon the result than the condition of the wound in the fibro-cartilage (A. f. G., B. lviii). Doederlein reports a penetrating vaginal tear. Sitzenfrey in Prague reports two perforating lacerations of the vagina in 7 cases. Hohlweg in Kiel reports two perforating vaginal wounds, in one of which the patient died as a result. Kannengieser had 6 extensive vaginal wounds in 21 cases. Reifferscheid, Bumm. Semmelink, and Pfannenstiel had prolapse of the vagina into the space between the bones. Rühl describes the worst bladder wound. This occurred in a iipara. The bladder and vagina were completely torn and everted. Most authors report brisk hemorrhage as the bone is separated. Usually the hemorrhage can be stopped readily by tamponade and counter-pressure within the vagina. In almost every case there is more or less of a hematoma of the vulva.

Hernia can occur through the split in the bone without lesion of any part of the belly wall. Mann reports 2 such cases (Z. f.G., p. 1283). The dangers of tears are greatest in primiparæ in whom the operation is most likely to be indicated if ever. Rosthorn had a death from hemorrhage beginning as the bones separated.

Rühle proved pretty conclusively from his 4 cases that severe bladder and vaginal wounds can occur as readily in hebotomy as in symphyseotomy.

SUMMARY

Relatively few cases of pubiotomy were done up to the last four or five years. Then came in the modified Doederlein operation; since then obstetri-

cians have been trying pubiotomy. The results as regards the death of the mother are about twice as good as for symphyseotomy, but we must bear in mind that most surgical results have been better the past five years than the ten years before that. Symphyseotomy came in when asepsis and general technique were not so good as now, so that a part of the good record of pubiotomy is probably due to better surgery. So that the conclusion I have personally reached in the study of the literature I have made is that there is very little difference in the good results and very little difference in the bad results of the two operations. To be said in favor of symphyseotomy, it is much easier done, does not require the technique, can be done with a blunt-pointed bistoury (and one is not apt to have the saw, Doederlein needle, etc., with him). On the other hand, I think the future of any pelvic-widening operation is not bright. The Cæsarean section mortality is falling year by year, and that operation will take the place of pubiotomy and symphyseotomy in all cases where the patient is seen early, that is, in all cases where we have the assurance of asepsis.

On the other hand, where we are going to open a bone in the performance of pubiotomy in the presence of wounds in the vagina and cervix, in the presence of the immense danger of sepsis there, where we are going to get a compound fracture, or in symphyseotomy where we are going to wound cartilage, which has a worse nutrition than bone, — in both these cases we are opening into something we do not want to get infected, any more than we would want a Cæsarean section infected. While the immediate results would not be so bad, yet the danger of death would be considerable, and the danger of long convalescence for the mother would be great in both. I think the indications for both symphyseotomy and pubiotomy will become narrower and narrower as time goes on. In individual cases the decision will be between Cæsarean section and perforation, rather than between symphyseotomy and pubiotomy.

LITERATURE

Sellheim; Monat. f. G. u. G., '06, p. 362.
Truzzi and Wendeler; Zentralb. f. G., '06, No. 37, and '07, No. 21.
Hammerschlag; Z. f. G., '07, No. 24.
Schikeles; Z. f. G., '07, No. 24.
Credé; Z. f. G., '06, No. 22.
Leopold; Z. f. G., '04.
Dolderlein; Arch. f. Gyn., B. lxxii.
Gigli; Z. f. G., '04, p. 1397 and 281.
Doederlein; Z. f. G., '04, No. 42
Sitzenfrey; Z. f. G., '05, No. 41.
Hohlweg; Z. f. G., '05, No. 42.
Pfannenstiel; Monat. f. G. u. G., B. 24, h. 3.
Rühl; Monat. f. G. u. G., B. 24, h. 3.
Sellheim; Z. f. G., '05, No. 36, abs. S. G. &. C., vol. i, p. 468.
Davis, E. P.; J. A. M., Oct. 19, '07.
Henkel; Zeit. f. G. u. G., b. lvii.
Frey; Monat. f. G. u. G., Sept. '07.
Leopold; Z. f. G., '04, No. 46.
Mann; Z. f. G., '07, No. 44.
Offergeld; Monat. f. G. u. G., B. xxvi, h. i.
Ferroni; Z. f. G., '04, No. 36.
Rühle; Arch. f. G., B. lxxxii.
Everke; Z. f. G., '06, No. 44.
Walcher; Z. f. G., '05, No. 36 and 48.
Kannengieser; Arch. f. G., B. lxxviii.
Reifferscheid; Z. f. G., '05, No. 42, and '06, No. 48.
Bumm; Z. f. G., '06, No. 32.
Semmelink; Z. f. G., '06, No. 48.
Stöckel; Z. f. G., '06, No. 3.
Rosthorn; Monat. f. G. u. G., B. 24, h. 3.
Bauereisen; Münch. med. Wochen., '05, No. 52.

PRELIMINARY AND AFTER TREATMENT OF ABDOMINAL SECTION[1]

A Report upon One Hundred and Fifty Consecutive Cases of Abdominal Section without a Death

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The preparation of patients for abdominal surgery should always be considered seriously, no matter how trivial the condition for which the operation is proposed. While recent surgical triumphs have marvelously minimized the mortality in opening the peritoneal cavity, it is still certain that every such procedure, for whatever cause, puts life in some jeopardy, the relative amount of danger, of course, depending upon the conditions for which surgery is proposed.

As a routine the urine should be carefully examined and measured, and in doubtful cases the blood should be counted. The alimentary canal should be fairly emptied, and the skin washed out as well as cleansed externally. We give all our patients sufficient laxatives to produce soft but not watery stools for one or two days before operation. For this purpose licorice powder or castor oil, followed by enemeta, are sufficient as a rule. The old time copious purgation has been abandoned, and salines are no longer employed. The patient is let absolutely alone during the night before operation. A night's rest is more important than so much fussy treatment as will frighten the patient and drive away her confidence, by giving an exaggerated impression of danger.

A final enema is always given from one to three hours before operation. Food is given freely as a rule, up to and including the noon meal of the day before the operation. Supper of this day is confined to fluids. Water is given freely for two days before operation — a half pint every two, three, or four hours in addition to fluids at meals. This is to wash out the skin and kidneys and stimulate the bowels. It is also useful in keeping the blood-vessels full. The patient is given a thorough soaking bath the day before, and a sponge bath the morning of operation. She does not take to her bed till after the midday meal before operation. After the thorough bath, the abdomen is thoroughly shaved and scrubbed with brush and soap, afterwards cleansed off with 70 per cent alcohol, and a compress wet with one to two thousand bichloride is bound on and worn over night. The vagina is always sterilized by soap and water washing; followed by 70 per cent alcohol, and a one to two thousand bichloride douche. On the morning of operation a final examination of the urine is sent to the operating room.

All patients are anesthetized in a room adjoining the operating room. The anesthetic is never started until everything is ready and hand sterilization has commenced by all connected with the operation. Sterilized gowns, caps, masks, and rubber gloves are worn by all.

Hand sterilization is secured by brush, soap, and water for fifteen minutes, followed by 70 per cent alcohol and one to one thousand bichloride, with emphasis on and faith in the soap, water, and brush.

After the patient is on the operating table, a final rapid sterilization of the field of operation is done, by washing with soap and water at a temperture of 100, this being washed off with 70 per cent alcohol and followed by a one to one thousand bichloride solution. This sterilization is done with as little wetting as possible and confined to the field of operation. The body is kept well covered elsewhere, and a sterile mattress is used on the table.

Anesthetic. Ether is used by preference, always by the *very* open cone or the "drop method." If the cone is well open and the ether dropped on a small portion of gauze, I see very little difference between it and the drop method. No nitrous-oxide gas or ethylchloride has been used as a preliminary to the ether or chloroform. I am afraid of both and believe that there have been more deaths per anesthetic minute from the nitrous-oxide than from any other anesthetic. Chloroform is given only when ether seems contra-indicated by lung or kidney complications or in the very old or infirm. The anesthetist is constantly cautioned to give the least possible of the drug to secure the needed relaxation and insensibility to pain. The patient should be conscious in a few minutes after the operation is over. If she is not, too much has been given or it has been given too long. I have had no experience with spinal anesthesia, morphine-scopalamine or other combinations, and am not likely to have.

Heart Stimulation. In not one of these cases was alcohol in any form used for heart stimulation.

[1] Read before Cincinnati Academy of Medicine, October 21, 1907.

Strychnia hypodermically in 1/30 grain doses was used in 15 of the cases. Normal salt solution was introduced into the vein in 10, and by subcutaneous infiltration in 6. No other form of heart stimulation was employed.

Drainage. With the exception of the gallstone cases and the cases of appendiceal abscess, abdominal drainage has only been used in four instances. Two of these were cases of very foul putrefaction associated with ectopic gestation.

These two cases were the most desperate of the type that I have ever encountered. In one, death of the fetus at four months had occurred ten months prior to operation. It was a case of abdominal pregnancy. The placenta was attached to coils of intestine, to right of and just below the umbilicus. The patient had a low grade of sepsis for the four weeks previous to operation. A mistake in diagnosis was made, because the patient had forgotten that she had missed four periods a year before. The diagnosis at time of operation was pyosalpinx. The fetus was found completely macerated, and was the foulest smelling matter I ever encountered in a living being. The sac and bones and other debris were hastily removed, and the partially putrid placenta was left attached to the intestines. A large drainage tube was carried from this mass through the abdominal incision, and another tube, from the same neighborhood, was carried into the vagina through Douglas's fossia.

The other case, No. 23, was a putrid fetus in the pelvis, for the most part, which was similarly drained. Diagnosis, however, was correctly made in this case. Both of these cases had a hard fight, but both recovered.

In one case a very large sarcoma of the ovary extended into the abdominal wall in the left iliac region, and a large space was left bare of peritoneum. Peritoneum was stitched over it, and a stab wound drainage was established into the pocket thus formed, by means of a rubber tube.

In another case a pus tube was densely adherent to the abdominal wall, to the left side just above Poupart's ligament. The peritoneum was removed for considerable distance and the omentum was brought down and sewed over to cover the breach. This was also treated by stab wound drainage just above Poupart's ligament. There was not the slightest infection in either case, and both have made splendid recoveries. Vaginal drainage was established in 11 of the cases.

Hernia. Most of these cases have been followed, and hernia has occurred, so far as information has been obtained, in but one case. Dr. Robinson of this city operated on it a month ago and reports that there were practically no adhesions of either omentum or intestines to the abdominal wall. This is most remarkable when the desperate character of the putrefactive placenta is considered. I do not believe that hernia under the method of closure employed will ever occur when infection does not take place.

After Treatment. The surgeon himself should personally direct the entire management of the case and should visit every patient daily or oftener during the convalescence. His presence must always be a source of comfort and the inspiration of needed confidence. As a rule, no after treatment is needed if the operation has been well and cleanly done. On general principles a policy of non-intervention is followed. There is no established routine. It takes great courage to let a patient alone and let her get well in peace.

Nausea and Vomiting. Washing out the stomach at the close of operation has been tried without satisfactory results and abandoned. The best preventive is the use of the least possible anesthetic. When patients are deluged with ether, they vomit frightfully; if they are barely kept under, vomiting usually occurs once or twice just as consciousness is returning, if at all, and not much afterward. The second and third day nausea of chloroform is best met by washing out the stomach and the giving of food in small quantities. I am skeptical of the value of drugs for the vomiting or nausea and never give them now. Nausea and vomiting must logically be regarded as symptoms, and prevention and relief must be directed to their causes.

1. The initial vomiting is due to direct irritation of stomach by mucus swallowed during inhalation. This is saturated with the anesthetic and is usually ejected with the first return of consciousness. It contains also the gastric secretion provoked by irritation, together with some bile in most cases. Theoretically, it ought to be washed out at the end of anesthesia, but washing at such time endangers the trachea more than the conscious vomiting fifteen to thirty minutes later.

2. The nausea, which occurs one, two or three days after, is due to central irritation. This is mostly after chloroform and is relieved by small quantities of food.

3. Nausea and vomiting, caused by renal insufficiency, for which normal salt solution by bowel, hypodermidoclysis or intravenous injection in large quantities, is indicated, together with skin, stimulation by hot-packs.

4. Nausea and vomiting due to sepsis. *a.* By intestinal distention, causing regurgitation of intestinal contents into stomach. *b.* The central

irritation of septic intoxication. The first is best relieved by enemeta containing turpentine and possibly by giving such purgatives as colocynth, although I have had no experience with the latter in several years. The second form of septic vomiting is only relieved by the control of the sepsis, for which I know of no satisfactory method. Antistreptococcic serum and alcohol are given, but neither has great or clearly demonstrated value.

Decubitus. The patient is usually put flat on her back with a low pillow and well wrapped in blankets, with hot water bottles. These are removed as soon as the rectal temperature reaches normal, and heavy bed-clothing is taken off at the same time. It is a great blunder to keep patients swaddled and sweating after they have reached a normal temperature. It is an enervating and depressing custom and does great harm. Old or infirm patients are put in the Fowler position or somewhere between it and the horizontal at once. This position in moderation is used also in cases when vaginal drainage is employed. All cases are turned from side to side, as they may wish. It is a great comfort to patients to have pillows under the shoulders and head, and these are always allowed. The knees are propped up also. This relaxes tension of the abdominal muscles and adds greatly to comfort. In general, the nurse is told to rub the back or shoulders, or make such local pressure as will give real or fancied comfort.

Water. Normal salt solution is given by bowel — seven or eight ounces at a time — as soon as it can be retained, and repeated every two or three hours until the patient can take water freely by the mouth. Water is given either hot or cold as soon as vomiting is well over. This will usually be in three or six hours, if the anesthetic has been properly given. The patient's taste or experience determines whether the water shall be hot or cold, and experience must determine the amount. Usually we let them begin with a half ounce every half hour, and increase as may be indicated.

The patient is allowed to rinse the mouth with cold water as soon and as often as she wishes.

Pain. Most patients suffer pain, but not all. The cases reported here had sufficient pain to require drug relief in about 80 per cent of the whole number, that is, one in five did not need anything for the control of pain. No routine method of treating this symptom has, therefore, been indicated. It seems unwise to give morphine with the anesthetic, or just after, because only four out of five need it. When pain occurs in such amount as to cause restlessness, overnervousness or sleeplessness, an anodyne is given, otherwise not.

If pain is moderate, two grains of phosphate of codeia are given with twenty grains of chloral hydrate in four ounces of water by rectum.

Sometimes where sleeplessness is not a factor and the pain is not very severe, codeia is given alone hypodermically, a half grain at a dose. If pain is severe, morphine is given hypodermically in quarter grain doses. Rest and freedom from pain are more valuable than the morphine is harmful.

Bowels. We have no routine treatment for the intestinal canal. The bowels are let alone, unless conditions indicate treatment. The internes and nurses are instructed to watch the upper edge of the bandage and look for any distention of the transverse colon. If it becomes at all marked, the patient is given a simple enema, containing two drachms of turpentine. If this is insufficient to produce the relief of distention, a high enema, consisting of four ounces of glycerine, four ounces of castor-oil, two drachms of turpentine, and a pint and a half of water is given high and slowly. If there is no distention, the bowels are left alone absolutely until the third or fourth day, when, if they do not move spontaneously, a simple enema is given. When patients complain of a sticky mouth and have a pasty or coated tongue at any time in convalescence, calomel, a half grain every half hour, for from three to six doses is given and followed by a simple enema or half bottle of citrate of magnesia. I am persuaded from careful observation that most of the trouble, arising from intestinal paresis, paralysis, or distention from whatever cause, is due to varying degrees of sepsis.

Much of this sepsis, it seems to me, is due to rapid and overvigorous manipulation of the bowels and peritoneum in the separation of adhesions. I fear that the desire to do a rapid or a brilliant operation is at the bottom, oftentimes, of the real or fancied demand for vigorous purgation, as indicated by intestinal distention. The operator who watches the clock or spectators while dealing with abdominal cavities, will meet more intestinal distention in the aftermath than the one who is oblivious to both. It is also true that the patient and careful covering of all exposed surfaces and stumps with peritoneum is a great preventive of trouble with the bowels.

When this is done, the argument that vigorous purgation will prevent subsequent adhesions need not be offered.

Bronchial Tubes. It is not questioned that ether is considered an irritant to bronchial tubes, and in many cases seems to provoke a mild bronchitis and sometimes a pneumonia in the convalescence, and chloroform is by no means free from the same possibility. The best relief for this

difficulty is its prevention by the lightest possible anesthesia. When it arises, the patient should be put in as near a sitting posture as possible and the chest covered with the emplastrum kaolini.

I do not know that drugs are of much avail in relieving this form of bronchitis, although we give codeia and iodide of ammonia occasionally. In one case of this series an ether pneumonia of mild type was developed, but did not interfere with the recovery. There were 8 cases of ether bronchitis and (strange to relate) 4 of these occurred in the last 10 cases. The bronchitis, however, has not in any way interfered with recovery.

Renal Complications. Renal complications in varying degrees are frequently the cause of great difficulty of convalescence. The modern practice of free use of water by mouth before operation, occasionally in the peritoneum during operation, and by rectum, vein and skin after operation, has very materially lessened the extent of these difficulties. It is well known that ether and chloroform anesthesia is often followed by changes in the urine. Kelly found casts in the urine in 15 per cent of the cases after operation. Wunderlich found casts in 24.6 per cent of cases following ether and 34.8 per cent of cases following chloroform. It is uncertain whether this is due to the anesthetic or to the waste products surcharging the kidney, incident to operation. At any rate the indication is clear to give the least possible anesthetic and secure the most rapid possible elimination by hydrotherapy, as before outlined.

As has been previously pointed out, nausea and vomiting sometimes develop as a consequence of renal insufficiency, and I am inclined to the belief that cases of acute dilatation of the stomach, which occasionally develop, are caused by deficient kidney elimination. In addition to the use of water in the manner just mentioned, saline catharsis is unquestionably indicated. I have never had satisfactory experience with any form of drug diuresis. The methods outlined, as mentioned, are more prompt, positive, and rational. The stomach, as a rule, is out of commission at such times, and drug administration is likely to make trouble. The ureter is sometimes cut, tied, or burned during pelvic operations, but no trouble of this kind was encountered in this series. Pyelitis, mostly due to the use of the catheter, has also been escaped in this record.

Uremic Amaurosis. Uremic amaurosis developed in Case No. 57, from whom a four-pound multilocular cyst of the ovary was removed, together with the appendix, and a uterine myoma as large as a goose egg was removed by myomectomy. The patient had passed no urine at nine o'clock the next morning, when she was absolutely blind so far as distinguishing objects was concerned. She could only detect light. She was immediately put in a hot-pack, given normal salt solution subcutaneously and perspiration established. Urine was passed in the afternoon of the second day. It was loaded with albumin and had some casts. The secretion of urine was normal in amount afterward, and she was able to distinguish objects in four days and vision was perfect in two weeks. Albumin and casts gradually lessened and wholly disappeared in ten days. This is the only case that I have ever encountered, and was doubtless due to the anuria.

Food. Patients are given a liquid diet as soon as possible, that is, usually by the afternoon of the second day. This fluid diet is, for the most part, albumen water, animal broths, and butter-milk. Sweet milk is not usually given. I do not believe that it generally agrees with patients just after operation. During the second or third day patients are allowed to have light diet of eggs, toast, and cereals. The third or fourth day, general diet after the bowels have moved. Generally speaking, patients are not urged to eat, but allowed any reasonable diet desired. There is no fear of their starving to death, and food will not be of much value until they want it. We have found it very useful and agreeable to let patients have chewing gum, if the mouth is sticky and pasty and there is repugnance to food. If you have never tried it, you will be agreeably surprised at the comfort it often gives.

Wound Infection. It is a great pleasure to report that in addition to the 2 cases with abdominal drainage, only 2 others in this series had any wound infection. One of these was a total extirpation of uterus, and the other was a pus tube.

The aponeurosis is always brought together by a running suture of silk-worm gut which enters the abdominal wall about one-half inch above the upper end of incision and emerges a half inch below the lower end. This is buttoned and shotted tight, and is not removed until the patient is ready to leave the hospital. The skin and fat, when necessary, are brought together with subcutaneous silk-worm gut sutures. These are removed on the eighth or ninth day.

No other suture material than catgut has been used in any other part of the abdomen. Chromicized catgut was used only in the ligation of the appendix and in the few cases where it was necessary to repair damage done to the intestines. Silk was not used at all.

Dynamic Ileus. Acute Dilatation of Stomach. Thrombosis and Embolism. Dynamic Ileus, acute dilatation of the stomach, and thrombosis and embolism are occasional unfortunate sequelæ of surgical operations, which have not been encountered in this series of cases. Indeed I have never seen the two former and never met but one case of thrombosis, which attacked the patient as she was putting on her clothes to leave the hospital many years ago. It was thrombosis of the right lung and caused her death in twelve hours. Logical conception of these conditions would probably class acute dilatation of the stomach as a sequel of renal insufficiency and dynamic ileus and thrombosis and embolism as manifestations of sepsis.

Secondary Hemorrhage. In this series there was one case of secondary hemorrhage. It was a desperate situation in which sarcoma of each ovary was removed. On the left side there was a deep adhesion in the pelvis. This did not bleed at the time of operation. Hemorrhage was announced by internes four hours later, and a few minutes afterward under anesthesia I reopened the abdomen and quilted over the bleeding area with catgut. The patient made an easy recovery, and although it is seven months since the operation, there is no evidence of recurrence of sarcoma, as I have just examined her.

Time in Bed. I have had no experience in letting patients out of bed during the first, second, or third day. As has been stated, they are allowed to sit up, or rather to be propped up, in certain conditions immediately after operation. I am dreadfully afraid of the catheter and allow patients to be lifted on to the commode to pass urine even as early as the second or third day, if it is necessary for voluntary micturition. Ordinary cases sit up in bed on the fifth or sixth day, and sit out on the seventh or eighth, leaving the hospital from the sixteenth to twenty-first day. No patient has left earlier than the twelfth day. I see no reason to change this practice and am not in sympathy with the practice of those who get patients out of bed on the second, third, or fourth days. It has never seemed sufficiently attractive or expedient for trial at our hands.

Bandage. While I doubt its necessity under the method of suturing employed, I still adhere to the custom of having each patient wear an abdominal bandage for at least three months after operation, although it is probably not necessary as a preventive of hernia. It unquestionably is useful in the comfort of support which the patients secure from its use.

	[illegible]	14
[illegible]	Sarcoma	2
	[illegible]	2
	Hematoma	3
	[illegible]	2
2. Adherent and diseased ovaries		3
3. [illegible]		40
4. [illegible]		1
5. [illegible]		1
6. Ectopic gestation		7
	[illegible]	27
7. Hysterectomies for	Carcinoma	3
	[illegible]	1
8. Retroflexion of uterus		13
9. Ventral fixation		1
10. Intraligamentous cysts		1
11. Gallstones	Bladder and [illegible]	
	Common duct 3	4
12. Intestinal adhesions		1
13. Appendicitis		15
14. Tubercular peritonitis		1
15. Ventral hernia		3
16. Abdominal fistula to intestine		1
[illegible]		1
Total		150

The accompanying table reports in detail the 150 consecutive abdominal sections without a death. Twenty-eight additional operations were performed on the 147 patients. No case has been declined in which operation seemed at all indicated.

All of the patients operated on in this series are living except two. One of these was a desperate papilliferous cyst of the ovary, Case No. 45. She died in fifty-six days after operation, apparently from obstruction of the bowels. Case No. 94, a double sarcoma of the ovary, died five months after operation, apparently from general extension of the disease to the abdominal cavity. Case No. 29, one of the four exploratory sections, is probably dead. The section was made six months ago, and it was found to be an inoperable sarcoma which had apparently originated in the ovary and spread to the general peritoneal cavity.

Dr. F. F. Simpson, in a recent report to the College of Physicians of Philadelphia, estimates that there were 75,000 abdominal sections done in hospitals in the United States in a year. The mortality varied from 1½ per cent to 24½ per cent.

I take pleasure in recording my appreciation of the assistance of Dr. F. B. Samson, who has been my assistant in a majority of these cases, and has been of very great service in keeping up the records and making the pathological reports.

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FEBRUARY, 1908

THE IRREDUCIBLE MINIMUM

A recent German publication has tabulated a series of statistics relating to the operation of hysterectomy, collected from various well-known clinics. The mortality varied from five to fourteen per cent, the average being, for the entire series, which numbered several hundred, about eight per cent. Such results cannot be regarded as creditable to modern surgery, and call for some critical remarks. If operators of recognized position furnish such statistics, what must be expected from the host of unskilled tyros who are practicing surgery in all civilized countries? That a high death-rate should follow the work of the latter class is not remarkable. It is, however, surprising that experts, holding distinguished positions, should furnish such records. Are these mortality percentages the lowest possible? Do they represent the attainment of the irreducible minimum? Emphatically not.

In various countries operators are at work whose results are decidedly better than those to which I have referred. How are these differences to be explained? Careful observation of operators and their methods furnishes the answer.

The term "aseptic surgery" has come to be regarded, in the minds of many, as a kind o mascot, which is supposed to permit operative procedures to be carried out on the human body, under any circumstances, without let or hindrance. The fascination of exhibiting manipulative dexterity too often destroys the sense of proportion, and makes the operator oblivious to other considerations. It is, therefore, easy to understand why there may often be found a tendency to neglect conditions which might be contra-indications to surgical procedures, or might lead to a modification of them. In pre-Listerian days, there was some excuse for the concentration of the surgeon's attention on the mechanics of surgery; in the present era, much more is required of him.

The careless use of anæsthetics is responsible for an unnecessary number of deaths, both immediate and indirect. It is very easy to fall into a routine administration, neglecting to give careful individual consideration to the proper selection and use of an anæsthetic, or to exercise supervision over the anæsthetiser. In many serious cases, a fatal issue may result from the use of chloroform or ether, which might be avoided by the use of nitrous oxide gas, or local anesthesia, for example.

The administration of anæsthetics is too often left to those who have had no special instruction in the art, a prevailing opinion being that no special preparation or fitness is required. Too strong a protest cannot be raised against such practice. The greatest degree of safety and efficiency is obtained only when the

anæsthetiser combines thorough knowledge with practical experience.

But it is to the actual work in the operating-room that the writer desires to call special attention. In the pre-Listerian days, the surgeon concerned himself only with the mechanical details of his operation. Knowing nothing of the causes of wound infection, though full of dread with regard to its occurrence, his chief object was to perform his work with speed and dexterity. Under modern conditions, the manipulations of the operator are but part of a series of performances, each of which is of the greatest importance in determining the outcome of surgical work.

The sterilization of instruments and dressings, the preparation of saline material, the cleansing of hands, and many other details of operating-room work, require constant supervision and scrutiny. Too often is this necessary oversight lacking on the part of operators, with the result that faults and imperfections creep into the system of technic, and remain there.

Modern technic is very simple in theory, but its practical details are elaborate, and cannot be disregarded by the successful operator. He should insist upon the methodic training of the hands and eyes of his assistants and nurses, so that the habit of working with precision may be acquired. Perfection in work, whether of the individual or of associates, is usually automatic and without conscious effort. Yet this standard is reached only after a long period of training, the minutest details being often repeated, in the early stages, with conscious effort, guided by an active intelligence. It is only gradually that the habit is acquired of acting without special attention. Unless this method of education be pursued, bad habits are certain to be formed, so that the operator or his staff, in crises or emergencies, or even in ordinary circumstances, may easily deviate from the proper line of action, and commit more or less serious errors in technic. Yet, in the surgical world, comparatively few have subjected themselves to this rigorous training.

A knowledge of the most important facts in bacteriology is essential to the greatest success, and it is advisable that this information should be gained by practical work in a bacteriologic laboratory. The censorship of the latter should always be welcomed by the operating-room, for by this alone can the failures in aseptic technic be determined.

The limitation of our knowledge, and other considerations, may place absolute perfection in surgical work beyond our reach, but it is certain that the irreducible minimum of fatality in surgical work may be brought considerably nearer to the vanishing point, if operators give as much attention to bacteriology, physiology, self-discipline and team-training, as they do to the mechanics of their craft.

J. Clarence Webster.

ANÆSTHESIA PARALYSIS

By anæsthesia paralysis is meant that form of paralysis which follows and is dependent upon the administration of a general anæsthetic. Büdinger,[1] one of the first to describe this condition, gave to it the name of narcosis paralysis, and believed it to be peculiar to chloroform narcosis. He recognized two varieties, a peripheral and a central; the former, involving mostly the muscles supplied by the brachial plexus, he attributed to compression of the cords of the plexus between the clavicle and the first rib. He was able to show that this compression is brought about by displacing the arm upwards and backwards over the head. The mechanism of this compression, as described by Büdinger, shows the clavicle first drawn upwards, bringing it in close contact with the first rib, at the point where the trunks

[1] Arch. f. Klin. Chir. Bd. 45.

of the brachial plexus cross the first rib. Extreme abduction of the arms also brings about a rotation of the clavicle upon its transverse axis, causing the sharp posterior-superior border to become the inferior-posterior, and thus further limits the space between the two bones, and compresses all of the cords, but mostly the upper and posterior.

Büdinger, by abducting the arm to a right angle with the body, could cause a considerable degree of compression in thin persons, in whom the cords are not protected by the usual deposit of fat.

He also noted that in certain cases a peculiar formation of the thorax and clavicle would permit of a greater degree of compression than ordinarily occurs. The position of the head was also found to change the relation of the clavicle to the first rib. When the head was drawn to the opposite side, and the nerve roots stretched, the brachial cords did not escape by sliding from underneath the clavicle. On the other hand, when the head was drawn toward the side upon which the arm was abducted, the nerves were seen to slip easily outwards, and escape compression.

Braun,[1] one of the earlier writers upon this subject, considers that anæsthesia paralysis of the upper extremity may be due to compression of the nerves at a number of different places in their course. He agrees with Noone, who believes that the commonest cause of the paralysis is an injury to the fifth and sixth cervical nerves, as they leave the spinal column. This is brought about by compression of the nerves between the clavicle and the transverse processes of the vertebræ, as a result of displacing the arms over the head during the administration of an anæsthetic.

Similar paralyses have been noted in the newborn, in breech presentations, when the arms become displaced upwards.

[1] Deutsche Med. Wochs., 1894.

Direct pressure of the head of the humerus upon the nerve trunks in the axilla, may be the cause of an anæsthesia paralysis. By drawing the arm upwards over the head, the radial pulse may be completely suppressed; the median nerve is at the same time submitted to supreme tension as it passes over the head of the humerus. By bending the elbow and rotating the forearm outwards, the ulnar nerve is similarly affected.

Pressure upon the individual nerve trunk, by the extremity coming in contact with the sharp edge of the operating table, or by compression of the nerve by permitting the patient to rest upon the arm during a prolonged operation, may be the cause for peripheral paralysis. These are identical with the so-called "sleeping palsies" of the upper extremity, and the obstetrical paralysis from pressure upon the lumbo-sacral cord by the descending head.

In operations in which the patient must rest upon the side, or those in which a latero-prone position is to be maintained, particularly when the duration of the operation is longer than usual, compression of the nerve trunks of the upper extremity is most likely to occur. Of the individual nerves compressed in this manner, the circumflex and the radial are subject to the greatest risk. When the Trendelenburg position is employed, the risk of a narcosis paralysis is greatly enhanced. In this position, with the patient's weight hanging from the flexed knees, which are brought in contact with the sharp edge of the operating table, and there fastened, injury to the external popliteal nerves, as they pass forward from behind the condyles of the femur, may cause paralysis of the muscles supplied by these nerves. In one of the author's cases, a bilateral paronial paralysis, followed a double salpingectomy, in which the Trendelenburg position was employed. This completely disabled the patient for six months. Restoration

of function of the paralyzed muscles was not complete until the end of a year.

Another danger of the Trendelenburg position is the tendency of the arms to be displaced over the head and hang downwards over the end of the table, thus favoring compression of the trunks of the brachial plexus or of the cervical nerves, after the manner described by Büdinger, Noone, and Bruns.

As a result of direct pressure upon the nerve trunk by the hands of the anæsthetist, we may also have paralysis or paresis of the facial nerve.

Flateau [1] mentions a case of this kind. In the author's practice, a bilateral facial paralysis that lasted six weeks followed pressure upon the facial made by the anæsthetist during ether narcosis, in an operation for recurrent appendicitis.

Another factor in the causation of peripheral narcosis paralysis, considered by some to be of importance, is the toxic action of the anæsthetic upon the peripheral nerve trunks. Casse [2] holds that while local injury to the nerves probably plays the most important role in the causation of these paralyses, yet the lowered resistance of the nerves to trauma, which predisposes to paralysis, is occasioned by the toxic influence of the anæsthetic. This follows chloroform narcosis more often than ether. In those cases in which the pressure has been insignificant, and the duration of the operation extremely short, the chief etiologic factor is to be found in the local neuritis resulting from the toxic effect of the anæsthetic.

The pathological basis of these narcosis paralyses varies greatly in degree of severity. In mild cases, in which a mere circulatory change in the nerve trunk results from compression, the disability soon passes away. In others, in which destruction of nerve tissue results from trauma, or where marked degeneration, resulting from the toxic action of the drug, seriously impairs the vitality of the nerve fibers, a considerable time may be required to effect a repair. On the whole, the prognosis is favorable, recovery being the rule. In these cases in which the lower nerves of the plexus are involved, giving the Klumpke type of paralysis, the prognosis is more favorable than when the upper nerves, with the associated Erb-Duchenne type, results. This is due to the more severe lesion that generally exists from compression of the upper nerves. With the latter, we may have an associated lesion of the cervical sympathetic, evidenced by myosis, retraction of the bulb, and flattening of the cheek, as has been observed by Krumm.[1]

Central narcosis paralysis is so rare as to be of slight importance. As to the cause, we have little direct evidence that is of value. Two hypotheses are to be considered. First, that the lesion is due to ischemic softening, following a hæmorrhage; second, that there is a primary degeneration, the result of the toxic action of the anæsthetic upon the cerebral cortex. When hemorrhage is the cause of the paralysis, we must assume an existing sclerosis of the vessels, which give way usually during the stage of excitation of an ether narcosis. Büdinger reports a case of paralysis of the left arm that followed an exploratory operation for gastric carcinoma. The patient died seven weeks after the operation. The autopsy revealed a clot upon the center, corresponding to the paralyzed extremity. Where softening of the cortex is found, without the presence of a clot, the paralysis may be considered as the result of a degeneration of the cortical cells, identical to that which occurs in other organs, as the liver and kidney, from the administration of an anæsthetic, particularly chloroform. Büdinger believes this to be a true coagulation neurosis. ALBERT E. HALSTEAD, M. D.

[1] Centralbl. f. d. Greuzgeb. d. Med. Chir., Bd. 40.
[2] Bull de l'Acad. Royal de Belgique, 1898

[1] Abst., Annals of Surg., Vol. 25

TRANSACTIONS OF SOCIETIES

MEETING OF THE CHICAGO GYNECOLOGICAL SOCIETY NOVEMBER 15, 1907

DR. J. B. DE LEE, PRESIDENT
DR. FRANK W. LYNCH, EDITOR

EXHIBITION OF SPECIMENS

DR. DE LEE: There will be shown a specimen of *Fibroma Molluscum Gravidarum* by Dr. W. H. Buhlig, which comes from a case of my own. Fibroma molluscum gravidarum is a new clinical entity. The term was introduced by Samuel Brickner of New York City, and the case was published in the *American Journal of Obstetrics* in February, 1906.

Fibroma molluscum is a rather common affection in pregnancy, which, now that attention has been called to it, will be described oftener than in the past. Its appearance is the same as that which attacks both men and women, with the difference that the warty excrescences are not so numerous as in that outside of pregnancy; they are more pedunculated and less like warts. The seat of the disease is around the neck and chest and under the breasts. Brickner describes these as characteristic, but in my case they were found on the forehead and the upper surface of the right hand.

This woman noticed in the seventh month of pregnancy little warty excrescences attached to the neck and shoulders, and this large one on the right hand. There were no symptoms other than their presence. This particular case was atypical, according to Brickner, who says they disappear within four or five months fter delivery. In my case the warts fell off before labor, except the one on the hand, which grew larger and larger and finally became infected and had to be removed.

In another case of mine a large wart appeared over the forehead and dropped off two or three weeks after labor without treatment.

Brickner explains the appearance of the warts as due to some abnormal metabolic action. That is as indefinite as a great many of the other manifestations of pregnancy.

DR. W. H. BUHLIG (exhibits specimen): This kind of tumor is described by Brickner as follows: They are small and usually pedunculated, two or three mm. in length and well pigmented. Microscopically, they present a covering of epithelium which does not dip down into the connective tissue as does the normal epithelium, an abundance of soft fibrous tissue with numerous connective tissue-cells and an extreme richness of vessels. Dr. Mandelbaum, who made the specimens for Brickner, found only remnants of elastic fibers and no mast-cells, plasma-cells, nor nerve tissue. The tumor we have here was larger than the ones Brickner reports. It was a centimeter or more in its greatest diameter and about half that in thickness. It was different also, because it was infected, and I have had a good deal of trouble in getting a section that shows an intact epithelium. Most of the specimens I have prepared show infiltration, due to the infection. I have been unable, in the center of the section, to demonstrate elastic tissue, mast-cells, or plasma-cells. The richness of the vessels is the striking point. I had an idea that something was wrong with the diagnosis after I had studied it for some time. There are too many vessels for a fibroma; even a soft one. I have been impressed with the lack of blood in so many of the vessels and with the uniformity of size and structure of these vessels. I recall that Brickner's article contains the statement that many of the vessels were surrounded by small accumulations of cells. I have been struck with the clinical history, the coming and going with pregnancy, and my opinion is that we are dealing, not so much with a fibroma, as with an angioma, or a telangiectasis. This is a mere suspicion as yet and I have no more reason than the facts mentioned, but it acts different from a fibroma and looks different. I have a section under the high power showing a large capillary, spreading right out into the tissue.

DISCUSSION

DR. SCHMAUCH: The specimen under the microscope does not look to me like a fibroma molluscum gravidarum. These growths are made up of fibrous tissue that contains many small bodies which are generally taken for some kind of infectious material. Now here we do not see much

fibrous tissue, but many blood vessels, and that is about all. I would like to justify the diagnosis of fibroma molluscum gravidarum. There is no doubt that many different excrescences might grow during pregnancy, and it is queer that these things fall off after the child is born, but I do not see anything in the specimen shown to justify the diagnosis given.

Dr. De Lee: The appearance of the disease, as seen in the clinical case, corresponds in general to that described by Brickner, who gave it the name. The disappearance of the warts at labor may or may not indicate that they have anything to do with pregnancy. I have not studied the specimen, but the clinical picture corresponds with that given by Brickner. The pathologists in New York who saw the specimens came to the conclusion that would be the best name for the disease.

I wish to report a case of *Torsion of the right ovary and tube, complicated with tumor of the left ovary, in a girl of thirteen*, the specimens of which, unfortunately, have been destroyed, but the clinical conditions are such as to warrant me in bringing it before you.

A girl of 13, who claims that three months previous to admission to the hospital she was raped, entered Provident Hospital with a diagnosis of appendicitis and pregnancy. The history is in brief: She entered the hospital on Sunday. On Friday she had been taken with a severe pain in the right inguinal region, rise of temperature to 101°, with nausea and vomiting, for which she went to bed. Her physician discovered an abdominal tumor. He disregarded the statement of the girl that this had been present eight or nine months, and diagnosed pregnancy of four and a half months, with appendicitis. The next morning the temperature and pains subsided, but the girl began to flow, so he diagnosed threatened abortion, and sent her to the hospital. She was prepared for curettage, but under anesthesia the os was so small that the dilator could not be introduced, and the operation was suspended.

EXAMINATION

A young girl with the signs of puberty pretty well advanced; there was a good deal of hair on the pubes, the breasts well developed, fat on the abdomen well marked. The right rectus was rigid and on palpation very tender, making the tissues underneath impalpable. On the left side a tumor which seemed to extend to the right side, but could not be outlined. This tumor extended to the neighborhood of the spleen, in the kidney region, and at first I thought it a tumor of the kidney. On vaginal examination this was the finding (illustrating with drawings on board). A small, infantile cervix projected sharply into the vagina; in the cul-de-sac of Douglas was a small mass exceedingly tender, and not outlined above. I could not feel the fundus of the uterus very plainly, but from the consistency of the mass I concluded this was not the retroverted uterus. On the left was found what was suspected to be a pedunculated tumor of the left ovary. The attacks of pain after each examination were marked, and the girl grew weaker day by day. These pains came every three minutes, simulating labor pains. The necessity for operation was clear. The diagnosis was made of left ovarian tumor with twisted pedicle, and pelvic peritonitis. At operation the left ovary was found distended into an immense single cavity cyst which reached up to the neighborhood of the spleen, and was removed. The right tube had been twisted one and a half full turns and had fallen back into the pouch of Douglas, making the mass which we had mistaken for an exudate. The twist was clearly defined and the tube was much swollen and congested and dark blue in color; the ovary was the size of a hen's egg and infiltrated with blood and serum. We left a small portion of the left ovary and the whole of the left tube, in the hope of not completely sterilizing the young person.

The after-history of the case was uneventful. The reason for bringing it before the society is the rarity of torsion of the tube and ovary, and the interest in the diagnosis, in that the torsion was on the other side than the one we suspected.

DISCUSSION

Dr. Carl Wagner: Referring to Dr. De Lee's case, regarding the differential diagnosis between pregnancy and tumor. In a case of the kind that I recently saw in consultation, a young woman had had for a month a tumor felt above the symphysis, which suddenly grew so rapidly that in three days its top reached to the costal margin on both sides. There was great resistance on the right side. Pregnancy seemed to be excluded on account of the moral standing of the girl; still, its possibility had to be taken into consideration. The sudden and rapid enlargement was the most interesting feature of the case. Diagnosis of hemorrhage into a cystic tumor had been made.

On careful examination we were unable to find the cervix. The rectal examination gave a bulging mass low down, mostly on the right side. Not to go to too great length, it seemed plausible to me, which afterwards proved to be the case, that we were dealing with a cystic tumor. The girl was 13 or 14 years of age. In the recumbent position

while the patient was being examined by three different men, the tumor suddenly was moved out of its place in the pelvis. It proved that the tumor left the pelvis and found more room during the recumbent posture above the ribs. The cyst was removed and found to bear the character of a dermoid ovarian cyst, and a hard, fibrous-like mass on the right side.

CARCINOMA OF THE CLITORIS

I take much pleasure in presenting to-night a very rare specimen. During the last two years there has appeared the report of only one case of carcinoma of the clitoris in the literature, according to the *Index Medicus*, one described by Dr. R. R. Smith. In the text-books of gynecology by Webster, Skeene, Findley, Pozzi, Schroeder, and Döderlein, there is not even mention made of this affliction. Only in Charles Reed's book I find reference made to this disease in a quotation of his with reference to Gaffe's case which constituted a primary epithelioma of the clitoris followed by very speedy lymphatic involvement. He also reports a case observed by Witacre with microscopic illustration. Kelly, in all his wide experience, has reported but two cases of this kind. In dealing with diseases of the clitoris, he says: "With a single exception diseases affecting the clitoris alone are exceedingly rare, while in elephantiasis of the external genital organs the clitoris is prone to be the organ most extensively involved. Carcinoma is rare." The most extensive reference to cancer of the clitoris is made in Veit's Handbook of Gynecology. This volume in a very brief résumé has collected 18 cases from the literature, and not 16, as Smith states in his article. Sixteen authors observed individually one case, and one of them reports two. The cases of Eisenhart and Torglers showed transgression of the carcinoma into the labia.

In my case the carcinoma of the clitoris invaded the region above into the mons veneris, causing a large defect in size corresponding to a crab apple. The growth started four months before operation as a small pimple which soon manifested a destructive character, and was treated during the time by the family physician for an ordinary ulcer. Salves of different descriptions were applied without any success. The patient, 70 years of age, never suffered much pain. She was of German parentage and has never been seriously ill. Neither were there any other pathological conditions present at the time of the operation. The operation consisted in the following steps:

First, dissecting away from the carcinomatous mass the urethra, which was intact. For safety's sake, a soft rubber catheter was placed in the urethra previously and acted as a guide.

Second, from the former seat of the urethra two oblique lateral incisions (sidewards and downwards) at an angle of about 150 degrees were carried through the upper part of the labia majora. From the outer ends of these two incisions vertical incisions in an upward direction of about 2 inches in length clear down to the periosteum followed, and these latter were united on their upper terminals with a transverse incision. The defect caused by the removal of the malignant growth necessitated a plastic operation, the successful result of which, especially cosmetically, was made possible by the following steps:

The upper transverse incision was continued into the healthy tissue bilaterally about one inch and a half beyond. Second, the lateral border tissues of the defect were undermined on the level of the periosteum until they could be made freely movable and brought in exact apposition. Lateral pressure exerted by means of wire suture passed through leaden plates, an inch in diameter, and fastened at both ends after tightening them with lead bullets, held the raw surfaces in correct apposition without any inflammatory reaction until the union had perfectly resulted.

What was left of the labia majora was sutured with fine silk in interrupted stitches, beginning at the lowest part. It is important to start way down at this end, as after bringing the correctly corresponding wound edges in apposition at that point, they turn under to some extent so that they are very hard to see and poorly accessible if one would come from above downwards.

The microscopical examination of the specimen was made by Dr. Maximilian Herzog: "Microscopic examination of the tissue removed shows that it is mostly composed of proliferated epithelial cells. The latter are of a large squamous type and they are arranged in alveolar nests, surrounded by fibrous connective tissue. The structure of the neoplasm is that of a typical alveolar squamous cell-carcinoma."

Dr. T. J. DOEDERLEIN then reported a case of *Pubiotomy*, and showed a number of deformed bony pelves. (Ses paper, page 176.)

DISCUSSION

DR. CHARLES E. PADDOCK, speaking on the relation of pubiotomy and symphyseotomy, said: Is pubiotomy a better operation than symphyseotomy? Will it take the place of the Cæsarian operation, high forceps, or version in contracted pelves? A few years ago symphyseotomy was placed before us by leading obstetricians as one

void of the usual mortality, morbidity, etc., of the other operations, and it looked for a while from reports that we might have at last found an operation such as we had been seeking. Soon, however, came reports of both maternal and fetal deaths from this operation, and it did not prove what we had hoped for. We now have under consideration pubiotomy. We find it praised and condemned by equally good men, and the question arises, Is it to revolutionize our operative obstetrics?

In the proper discussion of this subject we must take into consideration two or three factors: first, do we obtain the same enlargement of the pelvis and the same separation of the bones in pubiotomy as in symphyseotomy? Second, what structures are involved, and what is the effect upon these during or subsequent to the operation? That we might properly understand this, it seems necessary that we should know something of the anatomy of the parts involved. There are certain tissues which are injured in the pubiotomy, which are not injured in symphyseotomy. Do we do more damage in the one than in the other? We will concede that there is no difference in the degree of separation in the two operations; that the enlargement is comparatively the same. On the other hand, there is an irregular enlargement following the operation of pubiotomy which somewhat alters the shape of the inlet. The increase seems to be in that oblique corresponding to the same side as the incision. If the incision be on the left side, the left oblique will be the longer. The sacro-iliac joint will be thrown somewhat open, and the anterior ligament will be stretched and torn. Just what effect this irregular enlargement might have upon a case if left to nature to terminate, I am unable to say. As a rule, these cases are terminated artificially.

As to the anatomy of the parts, the abductor foramen is in close proximity and must be avoided. It never extends internal to the tuberculum pubicum. So if the incision be made just internal to the tubercle, it will escape the foramen. Inside of this is the pubovesical ligament, and any injury to this might mean the loss of support to the bladder. The crus of the corpus cavernosum clitoris runs along the lower border and ramus of the pubis, and is certain to be injured in its other two thirds, as it is in the line of the incision. The speaker before me referred to the possibility of escaping the cavernosum, which could only be possible by dissecting the periosteum from the bone, then passing the carrier between the periosteum and the bone. But even should this be done, it would be difficult to escape the hemorrhage. However, the hemorrhage is easily controlled and should be relatively a very small matter. Then the plexus of veins close to the uterus, vagina, and bladder are not so liable to be injured in pubiotomy as symphyseotomy. The other source of hemorrhage is in the vulvo-vestibularis, which extends down from the clitoris; this, however, is rarely injured unless the needle is passed too far forward, and the hemorrhage from this artery amounts to little. The periosteum also contains blood vessels which are injured, and this may cause a certain amount of oozing.

The muscles involved in the operation are many, and some have such an important function that upon their integrity depends the future welfare of the patient. First, and very important, is the pubovesical ligament, which I have mentioned before; next, the rectus abdominalis and pyramidalis. The rectus abdominalis remains attached to the bone, hence the integrity of the abdominal wall is preserved, whereas in symphyseotomy the fibres would be so torn that the support of the abdomen might be injured to a large extent. Upon the internal surface of the bone we find the abductor longus and, running obliquely, the abductor brevis. These are more or less injured. The levator ani extends from the inner surface of the body and ramus of the os pubis and reaches almost to the symphysis. Next in importance is the transversus perinei profundus, which surrounds the urethro-vagina and is attached to the bone as far as its junction with the ischium. These two muscles are important in the support of the uterus, and I think are not permanently injured in pubiotomy, as demonstrated by the absence of reports of prolapsus following the operation. Many more tissues are involved, but these are the principal ones. Now, the stretching of the symphysis pubis in symphyseotomy causes a stretching and tearing of the pubovesical ligament, a condition which is escaped in pubiotomy. Somewhat to be feared is the transverse stretching and possible rupture of the bladder, and the consequent injury to that organ. The transverse perinei profundus and other muscles in this region must deliberately be torn, in order that the bone can be separated. Following this we have report after report of cases that have been permanently injured with nonunion at the symphysis, ruptured urethras, vesicovaginal fistulas, etc. That pubiotomy has a distinct advantage over symphyseotomy there can be no doubt. The structures injured are not as important as in symphyseotomy. The object sought is to obtain the separation of the bones and enlargement of the pelvis with the least traumatism to the mother. While there must of neces-

sity be more or less injury, the recent reports of cases of this operation are more favorable than those reported of symphyseotomy after the same duration of time.

Dr. De Lee: In 1895, Queirel, a Frenchman, read a paper entitled, "Eleven Symphyseotomies which I did not do." Upon reading the article with this bizarre heading, I discovered he had determined eleven women for symphyseotomy, each of whom had been delivered spontaneously or with forceps. Some were delivered at home before they could get to the hospital, others after normal labor, or with low forceps operation, delivered of living children without serious interference. He evidently desired to show the fallacy of obstetrical judgment in regard to labors in contracted pelves.

I wish to report two cases of hebosteotomy — a term decided on at the last German Congress held in Dresden — which I did not do, not for the reasons given in the cases of Queirel, but because of contraindications.

The first was a primipara, 25 years of age, who had a flat, rachitic, generally contracted pelvis with a conjugata vera of 9 to 9½ cm. She had, in childhood, sustained a serious fall and had fractured her sacrum, so it had a shape as illustrated here (draws on board); there was callus still present on the back of the sacrum, and the cavity of the pelvis was encroached upon by the lower end of the sacrum and coccyx, so that I thought the child could not be delivered without the proposed hebosteotomy. The woman had been in labor twenty-six hours, the head was well moulded, the child in excellent condition, dilatation complete, and I intended to perform hebosteotomy. When I arrived at the patient's side I found the temperature 103°, pulse possibly 120 to 130, not very full, a foul discharge from the vagina; therefore I did not perform the operation, fearing general sepsis. I delivered the patient by high axis traction forceps with difficulty, but without perforation. The infant survived an hour or so, and died from the effects of the delivery. I confess, it would have been easier to have performed craniotomy, but those of you who have performed that operation on a living child will sympathize with any reasonable attempt to deliver a viable child. I was astounded that there was not the slightest amount of visible laceration after this serious operation; but the patient returned to the clinic in three months with almost a complete prolapsus of the uterus, showing that while visible lacerations had not been made, deeper ones must have been.

The second case occurred on my return from abroad. A Russian Jewess, aged 19 or 20, had been in labor for forty-four hours, had almost complete dilatation, and a child of normal size making a good attempt to enter the inlet, which was estimated 10½ to 11 C. D., C.V. 8½ to 9; transverse, 11 cm. This woman's pelvis had the sacrum projecting rather sharply into it. By means of the little outlet pelvimeter which I demonstrated several years ago, it was possible to measure the distance between the lateral walls of the pelvis, which was 11 cm., measured as accurately as any measurement could be taken. The distance between the spines was 10½, and between the tuberosities between 8½ and 9. We had to deal with a generally contracted, flat, rachitic pelvis, with the head well moulded, and it was reasonable to suppose that with a slight enlargement the head would enter.

The woman refused to allow any cutting operation. Cæsarean section was entirely out of the question. However, I was so enthusiastic about the operation from what I had seen abroad, and from the reports of the cases in the Congress at Dresden, that I determined to take the risk on my own responsibility without the patient's consent. I prepared for hebosteotomy and passed the needle, following the Doederlein method, i. e., passed the needle under the guidance of the finger on the posterior surface of the pubis. The finger half-way down the pubis pushed the head away, and protected the bladder. After passing the needle I did something not done before, as far as I have seen in the literature,— I catheterized the patient again to make sure there was no injury to the bladder, because I feel most injuries to the bladder are done by the needle and saw, and not by the separated bones of the joint tearing the bladder. On catheterization blood-tinged urine came away, and so I came to the conclusion I had punctured the bladder. No one has mentioned the puncture of the ureter. We know in cases of pregnancy the bladder is drawn up and squeezed against the brim of the pelvis, because fistulæ occur in this region, and in certain locations, as shown by fistulæ, the ureter is brought into danger. It was, therefore, possible that it was the ureter that was injured. Under the circumstances I withdrew from the operation. Had I had the patient's permission to perform pubiotomy, I would probably have withdrawn the needle and put it in again under more perfect guidance and taken the chance, but I felt the puncture of the bladder had changed it from a favorable to an unfavorable case, and therefore proceeded with the application of axis traction forceps and the demonstration that the head would not go through the

pelvis; in the meantime the child had suffered from the prolonged anesthesia, etc., the meconium was showing, the heart rate had fallen, and the unwilling perforation of the living — or rather the dying child was made. The patient made an absolutely perfect recovery. I put a catheter into the bladder, and a tiny clot came away. The catheter remained in place three days, changed thrice every day, and the woman has promised to come back next time for Cæsarean section.

A few points in regard to the operation of pubiotomy:

First, the dangers to the patient; lacerations of the bladder, and I must add of the ureter, and urinary infiltration, such as have been reported in literature. I believe a simple puncture of the bladder is harmless, especially with a round instrument, because I know it has often occurred unwittingly and unknown to the operator; you make these punctures for retained urine, and the patients do well even when the urine is decomposed and infected. But the saw wound is dangerous, and if this happens it is suggested that an incision be made and the bladder sewed up.

Hemorrhage from the incision also is to be feared. Von Rosthorn referred to a case where the woman died on the table in spite of efforts to save her. Experience has shown that after pubiotomy, when hemorrhage sets in, the quickest way to control it is to deliver the child, and then check the hemorrhage. In this case an attempt was made to check the hemorrhage without delivery.

The question of sepsis in cases of pubiotomy is not so simple. It is not simply a question of carrying infection in by the insufficiency of our technique, or simply the danger of infection that exists in the vulva and vagina, but another element, infected urine, and in case of bladder puncture the danger is greater. I believe in the case reported of urinary infiltration where the catheter became stopped up the patient would not have died had the urine been aseptic primarily. I have had cases of infected urine where it showed colonies of streptococcus. To this woman I gave urotropin, as in all cases where the bladder has been seriously bruised.

Lack of union; there were shown at this Congress at Dresden 26 X-ray photographs in some of which the union was undoubtedly bony, so the lack of union is not so much to be feared. When symphyseotomy was at the height of popularity I performed two operations, both successful for mother and child. One operation was performed for flat, rachitic pelvis in a woman with immense varicosities. She developed a small hematoma, but recovered without trouble. The other case was a contracted pelvis of the infantile type, the head visible, but it could not be extracted with forceps. The symphyseotomy wound communicated with an immense vaginal tear, the perineum being rigid, episiotomy was performed, requiring an extensive perineorrhaphy. The bladder prolapsed between the end of the bones, and the whole genitalia had to be adjusted by means of tampons, but she also made a recovery, and both these women have been delivered of living children since, weighing more than those I delivered, one spontaneously and the other by version extraction. I gave up symphyseotomy because of its brutality. It was an unlovely operation and I disliked to perform it, and that seemed to be the general reason why it was given up. Hebosteotomy, on the other hand, has not that repulsiveness; the frequency of lacerations of the vagina is not so great, and I predict for the hebosteotomy a longer existence and perhaps a little larger place than symphyseotomy ever will possess. At this Dresden Congress pubiotomy took up three fourths of the time, and we heard four or five hundred cases reported. They are doing hebosteotomy more in some clinics than they do episiotomy. In Bumm's clinic the month I was there they did 14. They let the woman go into labor and continue a reasonable length of time. If the head does not enter the pelvis they do a pubiotomy and let her continue in labor. Bumm teaches that the safety in pubiotomy lies not in immediate delivery, but in letting the woman deliver herself after the section of the bone. That is very simple. Of course, in an absolutely contracted pelvis Cæsarean section is done. But in those cases where formerly craniotomy was done on living children, they now let the woman labor, and when the head will not come down after a reasonable time, cut the bone. In Schauta's clinic Berger reported 26 cases without maternal death. While I was there, six weeks, I think they performed 6 or 7 more cases. In Chrobak's clinic they perform no pubiotomy. In Olshausen's they do not believe in pubiotomy. He prefers the Cæsarean section, or prolonged labor. In Paris the only operation I had a chance to see was symphyseotomy, and Pinard gave a number of reasons to prove it was easier and to be preferred to pubiotomy.

In Italy they perform pubiotomy, and Bossi told me they had great hopes for the operation.

When talking of the various methods of performing hebosteotomy, one must not forget to mention Ayers of New York. The subcutaneous method of performing the operation is to be preferred to the open. I mean the Doederlein method of half and half, the finger being used behind the

joint. Ayers of New York invented the subcutaneous symphyseotomy, and performed it in 11 cases successfully for the mothers, and I think, also, for the children; perhaps he lost one baby.

I wish to emphasize the point of spontaneous delivery versus immediate operative delivery. After the joint or the bone is cut, the patient is allowed to wake up from the anesthetic, a tight bandage is put around her to support the pelvis, and she is put back to bed being allowed to deliver herself, and experience shows lacerations of the perineum and vagina are less common.

Regarding the mortality, I think the reports published at this congress were very favorable, 3½ to 4 per cent for hebosteotomy, and that is favorable, when you consider the mortality of 3 per cent in Cæsarean section in the most favorable cases. In contracted pelvis you can perform hebosteotomy when the woman has been in labor for hours and attempts at delivery have been made, where Cæsarean section is contraindicated. The physician can with reasonable fairness recommend a hebosteotomy as an alternative to craniotomy on the living child, and any one who has performed the latter operation will be glad that there is something that can be fairly presented as an alternative. Of course, I believe that when you see a contracted pelvis during pregnancy, in which the chance of delivering a full term child at term is remote, these two alternatives should be given to the patient, the induction of premature labor or the performance of Cæsarean section under ideal conditions at term. The induction of premature labor at 7½ or 8 months will still have a place in practice.

Dr. Wagner: I think we should congratulate Dr. Doederlein for his case and thank him for bringing this subject before the society, as so much has been written abroad on this question.

While many cases turn out very favorably, it seems to me that the operation, after all, is not a proper surgical or anatomical one, and especially the operation of Crede. When I read the description of this operation a year and a half ago, it struck me as being most unsurgical. It provides a great danger in case of suppuration, because we have separated bone. But even without suppuration the operation is so complicated, going into the foramen with the possibility of rupturing and dislocating the bladder and even greater complications. The operation is not proper surgically and anatomically, for there is no fair possibility of controlling accidents such as tearing the bladder and blood vessels, as everything is done in the dark.

Another point, the possibility of embolism, which with the abnormal circulation at this time of a woman's life is not altogether improbable. In general surgery we have, since asepsis has been perfected, given up subcutaneous operations, which were done formerly on account of bad technique. Since we have reached our present state of technique, in the Achilles tendon operation, etc., we do the open operation, on account of possible abnormalities. I do not see why we should take this great risk in subcutaneous operations in the pelvis, when the tissue is so prone to infection, and in the presence of an infectious canal like the vagina.

Another point is that the needle goes through and the knife enters the labia minora, a tissue very poorly nourished and consequently easily infected.

Dr. Gaul: Last year on the 16th of September I was called in consultation in a case of labor. The woman had been in labor for two days; a midwife had been attending her for 36 hours, when a physician was called in to help out. He applied forceps repeatedly, but could not deliver. I found the head wedged in the pelvis and tried to apply the forceps, without result, and finally concluded something else had to be done. I found the fetal heart tone very good and did not feel justified in making a craniotomy. I took the woman to the hospital, and since the midwife had made repeated attempts at delivery, and since myself and colleague had also done the same, I concluded to perform a pubiotomy in preference to Cæsarean section, and I was glad I did, for there was a violent infection. I inquired for a hebosteotomy saw and found there was none in the hospital, and in my desperation I resorted to an open operation, cutting through the bone with a scalpel. The child was extracted with forceps, and was found to be asphyxiated. I wired the pubis and brought the parts together. There was a violent infection, but after five weeks this subsided, and the woman finally left the hospital with the parts healed up and in good shape. I saw her in April, and she had a perfect gait. It was a better result than I ever dared to hope for.

I think Doederlein's prophylactic placing of the saw is good in maternity hospitals, but would not do in general practice, as a man would not have much practice if he tried it.

Duehrssen advocates a single incision in the angle of the pubis and passed the saw around the pubic bone and back and around to the original incision. This I would not try.

Dr. Doederlein (closing discussion): I have seen twice in literature reports that the saw broke. This is explained by the fact that the saw is handled with the hands too close together.

I heartily coincide with Dr. De Lee's views as to the practicability of pubiotomy. I hardly think it will take the place of Cæsarean section.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

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AN ABSTRACT OF THE REPORT UPON THE FRENCH CONGRESS OF SURGERY PARIS, 1907

PREPARED FROM THE REVUE DE CHIRURGIE, 1907

BY AIMÉ PAUL HEINECK

I. THE INFLUENCE OF THE RŒNTGEN RAY ON MALIGNANT GROWTHS

Béclère of Paris said that neoplastic cells with few exceptions are more sensitive to the action of the Rœntgen rays than the neighboring healthy cells. The lethal dose for neoplastic cells is far inferior to that which can be tolerated by normal cells. He discussed successively the influence of the Rœntgen rays upon malignant tumors of the skin, of the mucous membranes, of those mucous membranes that are continuous with the skin, upon malignant disease of the mammary gland, of the subcutaneous tissues, and of the viscera.

1. *Malignant Tumors of the Skin.* In some of these tumors, the productive process exceeds the destructive. In such cases, there will be a palpable tumor of varying shape and volume. Some cutaneous epitheliomata have been cured by the use of the X-rays. It will be found, however, that it is most often of great advantage to combine surgical intervention to the X-rays. Other cases show a predominance of the destructive process and are characterized by a loss of substance of varying depth and surface area, by an ulcus rodens; other cases show an association of tumor and loss of substance. Under influence of the Rœntgen rays, malignant ulcers often take the aspect of a healthy wound; tissue-losses are repaired either partially or completely; cicatrisation follows. All cutaneous epitheliomata that have not extended beyond the derma can with few exceptions be cured by X-ray therapy. They can be cured definitely, that is without recurrence, if the dose of the Rœntgen rays absorbed notably exceeds the dose strictly necessary to secure an apparent cure. For these tumors, especially if they be located upon the face, Rœntgen-ray therapy is the method of choice. It cures them with an esthetic perfection which is attained by no other form of treatment. When the epitheliomatous tumors have progressed beyond the deeper layers of the skin, Rœntgen-ray therapy may be successful; more frequently, in the presence of these conditions, its use is attended with failure. Rodent ulcer is favorably influenced by the Rœntgen rays. The X-rays destroy the morbid tissue, arrest the ulcerative process, and often secure complete cicatrisation. In severe forms of cutaneous epithelioma X-ray therapy is a useful complement of surgical intervention. In the ulcerating forms, considered inoperable, though not curative, it is to say the least the best of palliatives. Its use against epitheliomata that have not extended beyond the derma is attended with satisfactory results.

2. *Malignant Tumors of the Mucous Membrane.* Those mucous membranes that are directly accessible to the Rœntgen rays are those which are continuous with the skin, are those present in the neighborhood of the natural orifices: the palpebral, the conjunctival, the nasal (only a portion), the labial, the buccal, the pharyngeal, the anal, the vaginal, the preputial, and other mucous membranes. In epithelioma of the mucous membranes, the opinion prevails that the X-rays are powerless. They are even considered harmful, by some, in neoplastic disease of the mucous membranes. This opinion is erroneous. Concerning epitheliomata of the tongue, some undoubted successful cures are reported. It must be acknowledged that these cures are not very numerous. Béclère himself

has seen the disappearance, under the influence of the Rœntgen rays, of an epitheliomatous tumor of the tonsil. These observations show that the neoplastic cells originating from the mucosal epithelium are no less sensitive to the action of the Rœntgen rays than those that originate from cutaneous epithelium. The infrequency of success attending the use of the X-rays in mucosal cancers is due to the rapid evolution of these tumors, to their rapid invasion of the lymphatic system.

3. *Malignant Tumors of the Breast.* Malignant tumors of the breast at all stages of their evolution can be benefited to a certain extent and for a period more or less long by Rœntgen-ray therapy. When the neoplasm is limited to the breast it may disappear under certain conditions, slow growth, etc., when subjected to the influence of the Rœntgen rays. After surgical intervention, X-ray therapy is very efficacious in the treatment of cutaneous recurrences. It causes a disappearance of the nodosities in the derma and heals, most always, the cancerous ulcerations whatever be their extent or their aspect. In inoperable and in recurring cancer of the breast, Rœntgen-ray therapy may obtain a local cure, may improve the patient's general condition, prolonging life, alleviating suffering, and offering the patient some illusions.

4. In malignant tumors of the connective-tissue type, sarcomatous cells seem to be more sensitive to the action of the Rœntgen rays than the epitheliomatous cells. In lymphoma, the use of the Rœntgen rays has given some happy results. In leukæmia and spleno-megaly, Rœntgen-ray treatment is a specific. However, the cure is only apparent. It retards death. Recurrence occurs and death follows.

5. As far as malignant tumors of the viscera are concerned, no beneficial results have been obtained, or if obtained, have been too slight to be noticed. Some fortunate results are reported in which the X-rays were used in malignant disease of the laryngeal mucosa, in malignant disease of the thyroid gland. The cases are few and their exact nature is not undoubted. Rœntgen-ray therapy as a rule is a two-edged weapon — it may heal, it may wound.

1. The dose may be excessive, and an excessive dose may be due to too frequent séances, to too prolonged exposure, to needless prolongation of the treatment. The excessive dose is more harmful to mucous than to cutaneous surfaces. A cutaneous surface can be dressed aseptically; a septic and infected cavity can not. Pigmentation, erythema, and desguamation may be therapeutic necessities, ulceration and mortification of the tissues must always be avoided. X-ray burns are painful; they take months to heal. They necessitate a discontinuance of the treatment directed against the neoplasm.

2. An excessive dose can contribute directly or indirectly to the progress of the neoplasm. Success in Rœntgen-ray treatment of malignant tumors is dependent upon four factors: first, the seat of the tumor, that is, the more or less superficial or deep situation of the cellular elements of the tumor; second, the sensitiveness of the cellular elements of the tumor to the action of the Rœntgen rays; third, the rapidity of growth, the rapidity of evolution of the tumor; fourth, the integrity of the blood-channels, of the lymphatic vessels and especially of the lymphatic nodes into which the lymphatic vessels of the region empty.

When a malignant tumor is operable it must be operated upon immediately. After the ablation of all malignant tumors, Rœntgen-ray therapy may be employed to prevent recurrence. In these cases the Rœntgen ray must be directed, not only upon the region operated upon, but also upon the lymphatic glands which drain the region of the operative field. In all inoperable malignant tumors, X-ray therapy is indicated. It is the only rational medication and the palliative agent from which we can expect the most.

X-ray therapy is not a rival: it is to be considered only an auxiliary, an aid, to surgery.

M. Maunoury, Chartres, said clinicians have lost confidence in X-ray therapy. This is a mistake, as the X-rays are a valuable weapon; skillfully handled, they give decided results. Outside of cutaneous epitheliomata X-ray therapy can only be considered as an auxiliary to surgical treatment. In inoperable cases, they are a valuable palliative. X-ray treatment is influenced by the method of application, also by the nature of the tumor. Their action is slow; it is local and superficial. It is difficult to determine beforehand what will be the result of their use. Peculiar individual idiosyncrasies exist. Accidents attending their use can occur.

This is the technique which I have adopted: When the operation seems to have been complete, that is, when all the neoplastic tissue appears to have been removed, I subject the operative wound to the action of the X-rays; the margins of the wound are then united, and the subsequent applications will be made through the skin. They are not begun until at least weeks have elapsed. If the operation has not been complete, that is, if all the diseased tissues have not been removed, I do not unite the edges of the wound, but pack the wound with gauze and make a weekly exposure of the X-rays either through the dressings or directly upon the wound. I have with this technique

obtained excellent results. I am thus enabled to diagnose early the first manifestations of a recurrence and to treat them energetically.

Among the accidents that can follow the use of X-ray therapy, X-ray dermititis is one which can usually be avoided. In subcutaneous cancers, true toxæmias, due to absorption of the destroyed cancerous elements, have been observed. These toxæmias manifest themselves by backache, diarrhea, vomiting, dyspnœa, and various eruptions. In some cases, death has followed quite rapidly. It is not proven that the use of the X-rays can aggravate or generalize an existing cancer. We must also state that epithelioma can develop upon the margins of ulcers, due to X-ray burns, and upon lupoid lesions that have been subjected to the X-rays. From the standpoint of technique, there are no absolute rules. To me, massive doses applied at long intervals are preferable. The (globe) is placed at least 15 centimeters from the skin. The surface irradiated must largely exceed the diseased region. You will avoid the formation of X-ray ulcers secondary to excessive irradiation by protecting sufficiently the parts treated. Often, you will be able to activate the cure by curetting the fungating portions of the tumor.

In cancer of the mucous membranes, the prognosis of X-ray therapy is less favorable. It is unusual for the neoplasm to be limited to the mucosa. Some successes have been reported, nevertheless. Use the knife and employ the X-rays as a preventive of recurrence.

In subcutaneous cancers and in cancers of the breast, surgical treatment must precede and then the X-rays may be applied. In cases that are inoperable because of the poor general condition of the patient, or inoperable because of the wide extent of the neoplasm, the X-rays may be applied.

As to visceral cancers, the X-rays are merely palliative. Some sarcomata are especially sensitive to X-ray treatment.

To summarize, Rœntgen-ray therapy is an excellent aid to surgery. All operable tumors must be removed and the X-rays employed subsequently; if feasible, before uniting the edges of the wound. If you fear a recurrence, leave the wound open so as to favor the action of the X-rays. Make no plastic operation until all danger of recurrence has disappeared. The involved lymphatic nodes must be treated the same way.

Pozzi, Paris. The X-rays have indications. High frequency and high tension sparks have an indication. They are both of value in the treatment of malignant tumors. The X-rays give excellent therapeutic and esthetic results in epitheliomata of the skin, especially those of the face. They at times secure complete disappearance of certain osteal sarcomata. In cancer of the breast, be it or be it not ulcerative, the X-rays do not obtain a complete cure. At times they attenuate the pain and retard the progress of the disease. In mucosal cancers, the use of the X-rays is attended by very slight if any therapeutic effects.

Fulguration applied to epitheliomata of the face gives results as brilliant as those obtained by Rœntgen-ray therapy. In the treatment of epitheliomata of the mucous surfaces, it also gives successes, but at times the success is more or less complete, just as the failure may be more or less complete. We do obtain attenuation of the pain and arrest of the hemorrhages. However, X-ray-therapy and fulguration are only auxiliary measures in the treatment of malignant tumors. They should be employed only when the knife is powerless to secure a total eradication of the disease, or in those cases where the patient, either through fear of the knife or for esthetic reasons, fears the operation. Both methods may be combined.

M. Doyen, Paris. I criticise Béclère for not fortifying his conclusions with statistics. He only reports temporary improvements. It is important to know how many of these patients have remained cured and how many have died after having been considered as cured.

As a matter of fact, the X-rays do not cure cancer. Far from that, they cure only small cutaneous epitheliomata, which are not cancers. In an established cancer, they give no lasting results, and their application is almost always followed by a rapid generalization, owing to their destructive action upon the lymphatic nodes and other lymphoid tissue.

M. Reynès, Marseilles. I often have had occasion to judge the results obtained in Marseilles by M. de Keating-Hart, with fulguration. The electric spark renders the tissue friable and bloodless. For this reason curettage should precede and not follow fulguration. I have always been impressed with the beneficial effects of high tension and high frequency sparks upon the hemorrhages and upon the pain of malignant tumors. I have seen cure following their use in cutaneous epitheliomata. I have never seen a case of visceral cancer which they have cured. The method is still new and the observations reported are too few to justify conclusions.

M. Willems, Gand. Under the name of lymphadenoma, malignant lymphoma, lymphosarcoma, and Hodgkin's disease, different diseases of the lymphoid tissue, characterized by absolutely different anatomico-pathological changes, have been confounded.

We may have:

1. A simple hyperplasia, more or less generalized, of the lymph nodes.

2. Hypertrophic form of lymph-node tuberculosis. The tuberculous nature of the granulation tissue present in these lymph-nodes has been demonstrated by inoculation tests.

3. Neoplastic lymph-node disease. This form has been taken for sarcoma. It should be called lymphoidoma, because it does not originate from the connective-tissue elements of the lymph-nodes. It is due to an atypical proliferation of the lymphoid elements. These lymphoidomata metastasize by way of the lymphatic vessels, and not by means of the veins as do the sarcomata.

Clinically, these three different forms have dissimilar symptoms.

In the hyperplastic form (No. 1) there is a lymphocytosis. In the tuberculous form, there is a leucocystosis. In the neoplastic variety, there are no blood changes. In the tuberculous form, there is usually an evening rise in temperature. The other two varieties are apyretic. Tuberculous lymph-nodes, owing to their early sclerosis, are harder in consistency than the other types. In the tuberculous form, hæmophilia is not uncommon, the fundus oculi shows leukæmic changes. In the simple hyperplastic and in the neoplastic forms, there are no retinal changes, there is no hemorrhagic diathesis.

These three varieties are influenced differently by the X-rays, while in the hyperplastic form the ganglionic masses melt with surprising rapidity under the influence of a few X-ray treatments; the neoplastic form is never influenced and the tuberculous form, if influenced, is only so after many months of treatment. In the simple hyperplastic form, operation is not urgent. It is imperative to intervene early in the tuberculous and in the neoplastic form.

M. Tuffier, Paris. In 1904, I said that though Rœntgen-ray therapy had given some good results in small cutaneous epitheliomata (have not all forms of medication given good results in these cases?), its action upon carcinomata of the mucosa, of the breast and of the viscera is nil and doubtful. My opinion has not been modified since. If anything, it has been strengthened.

The action of the X-rays must be studied separately in sarcomata and in epitheliomata.

a. The X-rays are "respectful caustics of the skin" — that explains their powerlessness towards subcutaneous tumors. Their inefficacy is not complete, however, and in ulcerating, granulating, bleeding tumors, the X-rays exert an hemostatic, cicatrising, and anodyne action. They can be used only as a palliative measure.

b. Until further notice, we must be very cautious in appreciating the results of X-rays in sarcomata. Under this name are grouped tumors of very different life-history, some of which never recur after removal, whatever be their volume or their seat; others which, though superficial and of very small volume, recur and metastasize with despairing rapidity. Further investigations are necessary. However, even now I consider that X-ray therapy in true sarcomata will only obtain failures. As to the statement expressed by M. Maunoury to apply X-rays upon a wound left open after a cancer operation, I consider that a step backward in surgical technique. That advice should only be followed in cases where after an extensive removal of tissue, approximation of the teguments is not possible.

M. Thiéry, Paris. I consider X-rays as completely powerless against subcutaneous, muscular, and visceral cancers. The only indication for their use is in some superficial cancers of the face, where for esthetic reasons the use of the knife is refused.

M. Gangolphe, Lyon. The X-rays can exert, at times, a beneficial action upon malignant tumors. I operated upon a patient with lymphadenoma. Recurrence yielded to the action of the X-rays. Two subsequent recurrences also yielded to renewed exposures.

I am acquainted with five cases of breast-cancers which, operated upon in 1903, were subsequently subjected to the X-ray therapy. They have not recurred. I am also acquainted with one case of recurrence of cancer of the breast which disappeared under the influence of the X-rays. This last case is as yet too recent to speak of permanent disappearance.

M. Morestin, Paris. X-ray exposures, when skillfully applied, should not provoke accidents. Their application is at times faulty. We can say that the X-rays possess no efficacy in the treatment of deep cancers. In the treatment of cancers of the breast, cancers of the mucosa, they possess no virtue, they possess no curative value. In small cutaneous epitheliomata, they do not obtain better results than the knife. Why, in face of the evidence that we possess, should we reserve the apparently mild cases to X-ray therapy and the serious cases to the knife? We think it is a mistake to lose precious time with X-rays. As for those wounds following the removal of malignant tumors, in which the edges cannot be approximated, it is justifiable to subject them to X-ray exposures.

MM. Léon Imbert et G. Dupeyrac, Marseilles. During the last three years, we have treated with X-rays the following cases. Successes and failures

are included. One hundred and seven patients were treated with the following results:

1. Cutaneous epitheliomata: 23 complete cures, 5 failures; that is, 82 per cent of recoveries.

2. Mucosal epitheliomata: 16 failures, 1 temporary improvement; 100 per cent failures.

3. Breast-tumors: Two small adeno-fibromata, 11 typical cancers; not one cure, some appreciable improvements. In one case, the improvement allowed us to operate a case which previously we considered inoperable.

4. Diverse tumors (prostate, epididimys, larynx, tonsil), failures as a rule.

To summarize, it can be said that the X-rays cure cutaneous epitheliomata, and secure an improvement in breast tumors, especially in recent recurrences. In all other conditions, failure is bound to attend their use.

M. CERNE, Rouen. The Rœntgen rays are not invariably curative in rodent ulcers. I have had failures and recurrences attending their use in this condition. Those cases that are to be benefited by this therapy will show improvement after the first few exposures. In visceral or deep tumors, the X-rays exert no action previous to operation. After operation, they seem to prevent recurrences. Therefore, I believe that they are indicated never before operation, always after. My results have been more satisfactory since I have observed the fore-mentioned rule.

L. MAYER, Bruxelles. In my name and in the name of Dr. Hauchamps, director of the X-ray laboratory of the hospital, I wish to relate several cases which were benefited in various degrees by the X-rays.

1. Several complete successes (lasting over four years) in a few cases of rodent ulcer of the face.

2. Lasting improvement in a case of Paget's disease.

3. Lasting improvement in a case (first treated over three years ago) of cancer of the breast, in which the axillary glands were involved and the patient had refused operation. The diagnosis was confirmed by microscopical examination of a removed axillary lymph node.

4. Use of the X-rays to prevent recurrence after operation in cancer of the breast. I see no necessity of leaving the operative wound open. The skin does not offer sufficient resistance to the passage of the X-rays to warrant this procedure.

5. Two cases of leukæmia, one of polycythemia. Cure was obtained in these three cases. In a case of sarcomatosis of an inferior extremity, which had been operated upon several times, we obtained a noticeable improvement.

M. BEGOUIN, Bordeaux. I have seen a case of cutaneous epitheliomata in the parotid region which could have been operated upon with great chances of success. The X-rays were employed instead. They failed, the patient came back six months after and the tumor then was inoperable.

In a second observation, the case was one of cancer of the breast in which the conditions were favorable for operation. The patient declined operation and was treated with the X-rays. For about a year conditions seemed to improve. She came back to us at about that time. The case was then inoperable. The knife should always be employed in the treatment of malignant tumors before using the X-rays. The only cases in which an exception may be made are cases of very superficial and thin cutaneous epitheliomata.

M. BÉCLÈRE, Paris. I would reproach to some who have taken part in the discussion that they have not completely read my report. As to the results, they are visible indeed. Owing to improved technique, accidents are less frequent than formerly. One mistake which seems to die hard is that the X-rays only exert a superficial action. In leukæmia, the gigantic spleens disappear rapidly under the influence of the X-rays. The X-rays never give birth to cancers. Chronic ulcers may at any time become epitheliomatous. Do not wait too long after the operation before applying the X-rays.

II. NERVE, MUSCLE, AND TENDON TRANSPLANTATION IN THE TREATMENT OF PARALYSIS

M. GAUDIER, Lille. I will consider in the first part of this report, such musculo-tendinous transplantations as are indicated in the treatment of infantile paralyses, be they spastic, be they flaccid. All transplantations can be classified under two heads: The transplantation of tendon to tendon, total or partial, and periosteal transplantation. In suturing tendon to tendon, it is preferable that either the whole or a part of the healthy tendon be sutured to the paralyzed tendon. The grafting of the paralyzed tendon upon an undivided healthy tendon has only exceptional indications. It generally gives unsatisfactory results. It is very important that the two tendons which are to be anastomosed be parallel in their course for as great a distance as possible. The tendons to be anas-

tomosed are selected only after a careful examination of the functional integrity of the muscles previous to operation and careful inspection of the muscles after the skin, fasciæ, and tendon-sheaths have been divided.

As suture material, the majority of surgeons prefer silk. Some use silk-worm gut, catgut, or silver or bronze wire. Immediately after the operation, the majority of surgeons make use of an immobilizing apparatus — most always a moulded plaster-of-paris splint which is replaced at a later stage by an orthopedic apparatus. The time during which this apparatus is to be worn is variable and is to be determined solely by the condition of the muscles, their functional integrity, and the solidity of the part or extremity. Electricity, massage, warm baths, and gymnastics are useful adjuvants to the operative treatment. All of these aids must be employed with caution. The patient must learn to utilize the new muscular conditions which the surgeon has created by the musculo-tendinous transplantation. In the musculo-tendinous transplantation, we have a therapeutic method of real value. The method must, to be most valuable, be employed with discernment. The results obtained by Vulpius are in the majority of cases very satisfactory, and superior, in cases of average severity, to these that can be obtained by arthrodesis or by the use of apparatus alone.

In periosteal transplantation, the healthy tendon is not anastomosed to a paralyzed tendon but is sutured directly to the periosteum or indirectly to the periosteum by a silken tendon. This periosteal attachment offers great resistance.

Nerve transplantation in the treatment of peripheral, facial, and infantile paralyses has given results. What can we expect of nerve transplantation in the surgical treatment of peripheral facial nerve paralysis, be it otitic or traumatic in origin. The ideal result would be to restore the parts to normal; clinically, transplantation cannot realize this result in the majority of cases, because the lesions are of long standing and have resisted all forms of medical treatment. We can overcome, more or less completely, the facial asymmetry and then, only during the period of rest. If the patient wants to obtain motion in the paralyzed side in case of spinal accessory and facial anastomosis, motility will be associated with motions of the shoulder of the same side.

Hypoglosso-facial transplantation enables one to avoid the inconvenient associations of motions of the face and of the shoulder, but in those cases where the trunk of the nerve has been completely cut, there persists lingual hemiparesis with atrophy. There will be temporary disturbance of deglutition and phonation. As to nerve anastomosis applied to paralyses of the extremities, 15 observations have been published to date. In 12 cases concerning the inferior extremities and of which we have a report, 8 have given satisfactory results. By satisfactory results, we mean a disappearance of the deformity and a return of muscular strength in the paralyzed muscle. In 4 other cases, the results were either not satisfactory or nil. For the upper extremity, two excellent results have been reported. We must always remember that the operation of nervous anastomosis must not determine new paralyses, owing to the lesions of the sound nerve. Economical procedures are to be recommended. Complete section of the paralyzed nerve must never be done. In infantile paralyses, nerve anastomosis is as yet a relatively new procedure. Musculo-tendinous anastomosis is a procedure of undeniable value.

M. Kirmisson, Paris. It is especially interesting to determine whether tendinous transplantation is really useful in the treatment of paralyses and to what extent we can count upon its efficacy. What makes difficult an exact appreciation of the value of tendon anastomosis is that in many of the reported cases complex operations have been performed. To the tendon anastomosis has been associated such operations as tenotomy, tendon-shortening, tendon-fixation. It is important that in the new cases to be reported in the future, that the late results be carefully noted, because it is not uncommon for an immediate result which appears brilliant to be transformed eventually into a complete failure. It would be important if the authors who have been most enthusiastic over tendon-transplantation could come to an agreement as to the true value of the methods employed. Can we depend upon a partial transplantation, or must we have recourse to a total transplantation? What are the exact comparative merits of transplantation of tendon to tendon? We must not forget the real aim of tendinous transplantation. It tends to restore not only the shape of the part but also the function of the part by transferring to the paralyzed muscle the action of the healthy muscle. If the patient is not able to perform those actions which he could not perform before the paralysis, if the shape of the limb has not been restored, we cannot say that a complete result has been obtained.

A good many of the partisans of plastic operations on tendons do not make use of arthrodesis: some say that this operation deprives the foot of suppleness and of elasticity, others say that there persists in the joint mobility interfering with good functional use. For my part, I con-

sider these two criticisms as not very well founded. I have performed 40 arthrodeses, some upon the foot, others upon the knee, and I have obtained satisfactory results. In those cases, where most of the muscles are paralyzed, I prefer to perform arthrodesis to the performance of complex operations upon the tendons, because it gives results far more advantageous and far more certain. Up to now, the exact value of tendon transplantation cannot be exactly stated. Exaggerations of its value have been published and it appears that results have been asked of the method which it really cannot give. Tendon transplantation is not a routine method of treatment in infantile paralyses. The primary indication is to correct vicious attitude by forcible correction, alone or associated with different plastic operations upon the tendons: tenotomy, tendon-shortening, tendon-lengthening. At a later date, the results may be improved by tendon transplantation. Tendon-transplantation finds its indications in cases of slight or moderate severity. In cases of great gravity, arthrodesis is the operation. In spasmodic paralysis, the indications of tendon transplantation are still more limited. The subject must be further investigated. In Little's disease, tendon transplantation does not seem to have any indications.

The results of nerve transplantations have not been under observation long enough and the cases reported too few in number to justify one in formulating a judgment as to the value of the procedure. It is possible that nerve transplantation will limit the field of muscle transplantation, perhaps completely supplant it.

M. Hoffa, Berlin. The aim in all tendon transplantation is to restore to the paralyzed extremity, first its normal shape and second its normal function. The failure is complete when these two aims are not realized. Complete failures are exceptional. They are due to four different factors:

1. Faulty pre-operative treatment. 2. Operation defectively planned. 3. Defective technique. 4. Incomplete complementary treatment.

The first step is obtained by the correction of the deformity and the contracture before the operation. The second consists in determining the condition of all the muscles, that is determining those that functionate and those that are paralyzed. The third is usually due to defective asepsis. I employ neither mask nor gloves. Previous to operation I boil the silk for ten minutes in a solution of one to a thousand bichloride of mercury. The skin is sutured with silk. The field of operation must be bloodless; Esmarch's bandage obtains this condition.

Transplantation of tendon upon tendon and transplantation of tendon upon periosteum are operations that complete each other. The grafted tendon must have a suitable degree of tension; This is obtained by tendon-shortening. The suture of tendon to the periosteum is the preferable method. The post-operative treatment is most important. Leave the limb hypercorrected from 6 to 8 weeks. Have the patient wear a removable orthopedic apparatus for at least 6 months. Make use of massage, electricity, and exercises. If all the muscles are paralyzed, resort to arthrodesis. In spasmodic paralysis, first tenotomize the spasmodic antagonist, then by anastomosis transfer its surplus of energy to the paralyzed antagonist. I see in Little's disease no appreciable advantage in tendon anastomosis over tenotomy, correction of existing deformity, and wearing of an orthopedic apparatus.

M. Robert Jones, Liverpool. I have performed 253 musculo-tendinous anastomoses. In my opinion, tendon anastomosis can accomplish the following results: 1. Can fortify a weakened muscular group; 2. Can overcome symptoms dependent upon complete paralysis of a single muscle or of a group of muscles; 3. Can lessen the predominating action of a muscular group in cases of spasmodic paralysis; 4. Can transform the action of a tendon that is acting faultily, for instance, in congenital club foot, the tendo Achilles can be transplanted to the outside of the calcaneum; 5. Can be an auxiliary in partial arthrodeses.

I have 51 times transplanted a tendon upon a tendon, 167 times transplanted a tendon upon the periosteum, 17 times sutured a tendon to bone, and I also have had 11 cases of muscular suture, 7 cases of transplantation of the tendon of Achilles to the ligament of the patella. Suturing the tendon to bone or to periosteum gives the best results. In cases of recurrence, post-operative treatment has been faulty. A transplanted tendon when once it has begun to functionate should never again lose its function. If there be a recurrence of paralysis, the tendon has undergone relaxation, has undergone overdistention; to avoid that accident, for several years the foot must be so fixed that the weight of the body cannot act upon it. A recurrence of the paralysis, in my opinion, is always due to the surgeon's negligence.

I attribute my failures to the following causes:

a. Defective tension of the reinforced muscle. *b*. Insufficient pre-operative correction of the deformity. *c*. Too rapid adhesions to the surrounding tissues of the transplanted tendon, insufficient liberation of the tendon. *d*. Excess or absence of tension of the transplanted tendon.

Patients under five years of age I do not operate.

In them the operation can with advantage be postponed. Some time previous to operating, by manipulations, by apparatuses, or by tenotomy, I correct the deformity and keep the foot in the position of hypercorrection.

As to the technique of transplantation I preserve, when possible, the tendon-sheath. In 10 cases of spastic paralysis I have performed tendon anastomosis. I have in four cases transplanted the flexors of the wrist upon the extensors. In six cases, I transplanted the biceps or the semimembranosus upon the patella. In 15 cases of congenital club foot, I transplanted the inner half of the tendo Achilles to the outer border of the calceneum and the tibialis anticus to the external border of the foot. In this series, I obtained 12 satisfactory results. Do not transplant until at least 2½ years have elapsed from the beginning of the paralysis. Failures must be avoided by

1. Correcting all deformity before transplanting.
2. Removing a cutaneous flap so as to be sure that hypercorrection will be maintained.
3. Suturing the tendons firmly to periosteum or to bone.
4. Maintaining the position of hypercorrection until voluntary motion is noted in the tendons.
5. Seeing that during locomotion the transplanted tendon is not subjected to the body-weight.

M. F. Lange, Munich. In tendon anastomosis, success depends, first, upon the adoption of a simple, uncomplicated operative technique and upon the observation of a rigorous asepsis. I employ strong curved, round needles. My thread is boiled in a solution of bichloride, one to a thousand, and then soaked in paraffine.

I have performed periosteal transplantations for the last ten years. To secure abduction of the lower extremity, I detach from the great trochanter the upper end of the vastus externus, which I then with the aid of 8 or 10 long silk sutures unite to the iliac crest. Adhesions are responsible for many failures. The transplanted tendon adheres very firmly to bones, to ligaments, to fascia, and to tendon-sheaths. To avoid these adhesions, you must transplant the connective and adipose tissues which surround the muscles, the tendons. You must be careful not to injure the tendon-sheaths. If adhesions be formed, a secondary operation will be necessary. To prevent adhesions, it is well to place adipose tissue between the transplanted tendon and the contiguous bone or fascia.

M. Oscar Vulpius, Heidelberg. I do not want to combat arthrodesis. In some cases it is necessary. It should not be compared with tendon transplantation. It has different indications. Often failures in tendon transplantation are due to unwise selection of cases. In my opinion premature operation is criminal. Never operate until the paralysis is of at least one year's standing. A well-conceived operation avoids failures. The electric examination is important. An exploratory incision is not harmful. I prefer total transplantation to partial transplantation, but if it be not feasible, partial transplantation is possible; or an antagonistic muscle may be utilized. Artificial tendon is indispensable only in a few cases, the paralyzed tendon offering enough solidity for the sutures. The periosteal method, I use only for fixation of the quadriceps.

Recently, I saw a tendinous transplantation which I performed upon the extensor communis digitorum four years ago. The result was irreproachable. Can a partial transplantation be used so as to divide the function of a muscle? The numerous successful anastomoses of the anterior tibial and of the extensor communis digitorum enable one to answer that question in the affirmative. Can antagonistic muscles change their functions? Can a flexor become an extensor? Yes. I can show many cases where the biceps femoris extends the knee. Can a partial transplantation of an antagonistic muscle succeed? Again, I answer yes. For instance in a young Frenchman, one of my patients, half of the triceps acts as a flexor of the elbow, the other half continues its role of extensor of the forearm on the arm. The results have not always been lasting, but that does not speak for rejection of the method. The failures are due to

1. Unwise selection of cases.
2. Faultily conceived operation.
3. Defective technique.
4. Inefficient post-operative treatment.

Most recurrences occur in the destitute because they are deprived of post-operative treatment.

M. D. Giordano, Venice. My patient was two months and a half old when I first saw him. There was a tumor the size of an egg in the lumbar region. This increased so rapidly in size that a rupture was feared. When I first saw the patient, this tumor was the size of a fetal head. It was not reducible and it became tense when the patient cried. Bilateral club foot. Operation for spinal bifida was successful. Incontinence of fæces and urine persisted. Deformity of the foot increased. I saw the patient again at the age of 7½ years. There had been physical and mental development but the deformity persisted and there was incontinence of fæces and of urine. I resolved to establish competent sphincters. Since an exclusively nerve transplantation would have been too

delicate, I decided to make a transplantation of muscle and nerve. By transplanting together a portion of both obturator internus muscles, with filament of the obturator nerve, I succeeded in establishing continence of urine and continence of fæces. I cured the club foot by lengthening of the tendon of Achilles and by transplanting the peroneal tendons to the Achilles tendons.

M. WILLEMS, Gand. I have performed 21 tendon transplantations in cases of paralytic club foot, varus or valgus, and I must acknowledge that my later results are not as brilliant as those obtained by my German colleagues. In 16 cases, I have had 15 recurrences. Discouraged by these failures, I have lately resorted to fixation of the paralyzed tendons, and the end-results are excellent. I simply fasten the tendons upon the bone by inverted U-shaped nails.

M. CH. GIRARD, Geneva. In four cases of spino-facial nerve anastomosis which I have performed, the first three were end to end anastomoses. The fourth was a termino-lateral anastomosis. I have been able to keep under observation the three last cases. I have had improvement in all but not complete successes. We know that adhesions and cicatricial hypertrophies can form around the outer portion of the nerve and thus compromise results. It is necessary to protect the suture from compression. It has been recommended to cover the nerve at point of suture with fatty or muscular tissue, to conceal it in a decalcified bone-tube, or in a tube of formalized gelatine, or in a dog's artery, hardened by formaline.

In a case in which I liberated the median nerve from a compressing mass of connective tissue, for protection of the nerve, I surrounded it with a small piece of gutta-percha tissue. Recovery was complete and permanent.

The paralysis of the tongue, palate, or of the trapezius following hypoglosso or spino-facial anastomosis is not an insignificant accident, and we must endeavor to avoid it. I never make total division of the hyperglossal nerve.

M. VIDAL. I have performed a spino-facial anastomosis upon a young lady. The result was incomplete and not brilliant. The second case was a case of obstetrical paralysis. The patient was three years old. I anastomosed the hypoglossal nerve to the facial nerve. The results were good; the operation, however, was laborious and difficult.

In enucleating a cystic goiter the recurrent laryngeal nerve was cut by one of my associates. There followed a paralysis of the corresponding vocal cord. I later implanted the recurrent laryngeal nerve in the thyroid body. I did not expect a success, but at the end of 7 months there was a disappearance of the paralysis of the recurrent.

M. PEUGNIEZ. I have anastomosed the facial nerve three times with the spinal-accessory, once with the hyperglossal nerve. My first patient of spino-facial anastomosis maintained a complete recovery. My second shows marked improvement. The improvement continues but the restoration of function is not complete. In my third case, not being able to find the spinal accessory nerve, I made use of the hyperglossal nerve and the result was very satisfactory. I was equally successful in my fourth case. A fifth patient had paralysis of the deltoid. I anastomosed the circumflex with the musculo-spiral nerve. There was complete restoration of function.

M. P. REDARD, Paris. Muscular tendinous transplantation is a method of value. It does not often give complete restoration of muscular equilibrium and of muscular power, but usually there is improvement of motion and the deformity remains cured. Tendon transplantation is indicated particularly in flaccid, incomplete paralysis. In paralytic club foot, the results are not satisfactory when many muscles are involved. Transplantation upon the periosteum will be found of value chiefly in those cases where tension of the tendon of the paralyzed muscle must be avoided. It is of value too, especially in supination and pronation of the foot. It often has to be performed in paralysis of quadriceps femoris and in paralyses of the upper extremities. In Little's disease and in the various spastic affections, tenotomy is done in many cases. First correct the malformation; later you can make what transplantation you judge necessary.

M. DELAGÉNIÈRE, Le Mans. In talipes equino-varus, I perform in some tenotomy of the tendon Achilles; in others, the more extensive Phelps-Kirmisson operation; in others, arthrodesis. At times, we perform one operation; but far more frequently we combine several of the operations. The section of the tendon of Achilles combats the equinus, but compromising the extension of the foot upon the leg. Phelps' operation overcomes but incompletely the vicious inward inversion deformity of the foot. Astragalectomy and more or less extensive tarsectomy find their indications in adults in those cases where the astragalus is very prominent. I have performed thirteen tendon transplantations, the results of which were satisfactory in 11 cases.

In talipes equino-varus, it is our opinion that tenotomy of the tendon Achilles should be supplemented by the transplantation of the proximal

divided end of the tendon Achilles upon the tendon of the peroneal longus.

M. Mencière, Reims. Tendon grafting, — what is its value? It must be combined with operations upon the skeleton, upon the joint capsules, but its action is not disputable. I show you here the photograph of a child 10 years old, where the transplantation of the trapezium has very well supplied the function of the paralyzed deltoid. Post-operative treatment is of the greatest importance.

I have performed 260 operations for various paralytic deformities. Ten per cent of all cases are incurable, consequently no treatment need be suggested for them. Seventy per cent of the cases are either curable or curable to a marked degree. In 20 per cent of the cases, the deplorable conditions of the patient is improved, though no cure is restored.

M. Péraire, Paris. Musculo-tendinous transplantation in infantile paralysis is valuable. To secure success, hasty operations should not be performed. You must only attempt to restore the function of the muscles that are totally paralyzed. Thorough familiarity with the operative technique is essential. Post-operative treatment is important. In many cases, only the deformity is overcome, the function of the muscle not being restored. The things to which are attached the most importance are, asepsis, anesthesia, the use of the Esmarch bandage, and the correct employment of plaster of paris. We have divided the cases into simple and complicated cases of infantile paralysis. The technique in these cases differs markedly. The surgeon after careful examination of his patient, must determine whether the tendon must be lengthened or shortened. I am opposed to tenotomy. In cases of infantile paralysis, associated with osseus and articular deformities, in addition to operations on the tendons, operations upon the skeleton are indicated. Among these operations, those most frequently employed are astragalectomy, cuneiform osteotomies, and tarsectomies.

IN CONCLUSION

Kirmisson said, I will not add anything to what I said in my opening remarks. I am firmly convinced that tendon anastomoses give far better results in traumatic than in infantile paralyses. Tendon anastomosis can only be considered an adjuvant treatment in infantile paralyses.

III. MISCELLANEOUS

INJECTION AND IMPLANTATION OF PARAFFINE INTO THE TISSUES

M. H. Eckstein, Berlin. It is known that the injections of soft paraffine have disadvantages. Hard paraffine is never followed by undesirable complications. It is a purer substance and is better tolerated by the tissues. The skin must be supple, elastic, mobile. To obtain that you have to mobilize the skin with scissors after having incised it. Hard paraffine is liquefied at a temperature of 75° centigrade. I use Broechaert's or Mahu's syringe. The injection is made cold.

This method gives excellent results in rhinoplasty. It can also be used with advantage to elevate depressed scars.

M. Broechaert, Gand. I am an adept enthusiast of the injection of solid paraffine. The few accidents that have been reported cannot be attributed to the method; faulty technique or impurities in the paraffine are responsible. With paraffine I have restored over 200 noses and some very beautiful esthetic results have been obtained.

MELANOTIC TUMORS TREATED WITH ARSENICAL PASTE OF CZERNY

M. J. Reverdin, Geneva. Reverdin reports two cases of melanotic tumors treated with the arsenical paste of Czerny. Melanotic tumors are usually exceedingly malignant. In a patient 90 years old, I treated an epithelioma of the ear and a melanoma of the cheek. I used Czerny's formula, containing arsenic compound with orthoform. The epithelioma was not influenced. The melanotic tumor of the cheek was cured. In another case, upon a patient 48 years of age, I used the same treatment for an exaggerated melanic stain of the cheek. Below it was a small pedunculated tumor. This application caused depigmentation of the tumor and then cure was obtained. These cases are two years old.

EXPERIENCE WITH ANTI-CANCEROUS VACCINE

M. Doyen, Paris. My experience with anti-cancerous vaccine by the employment of attenuated cultures of the micrococcus neoformans dates back 7 years. Numerous patients have been treated, 3, 4, 5, and 6 years ago. Other favorable reports concerning the vaccinal action of the micrococcus neoformans have just been published in London. Among the successful results, are 2 cases of laryngeal cancers, which were treated with vaccine prepared by Prof. Wright. Prof. Wright obtained his first results with cultures coming from my laboratory. To-day, we are going to compare the

effects of anti-cancerous vaccination with the mode of action of the different physical agents of acknowledged activity against superficial and easily accessible cancerous lesions; for instance, the Rœntgen rays and radium. How do these forms of local treatment act? Numerous histological examinations have shown that the curative process is identical whatever be the agent employed. There is first a tumefaction of the cells, the outline of which becomes indistinct, the chromatin of the nucleus undergoes fragmentation and loses the faculty of taking up stains, then necrosis ensues. The presence of a large number of migratory cells shows the influence of phagocytosis in the curative process. There is one thing that has been well demonstrated. It is that these different physical agents only act superficially and are incapable of affecting the vitality of cancerous cells located at even a moderate distance from the surface.

We have seen that the prolonged action of X-rays upon deep cancers, after having been followed by indisputable improvement, frequently provokes rapid generalization of the cancer. These accidents of rapid aggravation must be attributed to the alterations induced by the X-ray exposures in the lymphoid tissues. These lymphoid tissues are centers of defense against all external agents, organic or inorganic. We know that the lymphoid tissues are very sensitive to the noxious action of the X-rays. We know that certain sarcomata when deep, are particularly sensitive to radiotherapy.

Some sarcomatous cells offer less resistance to the X-rays than the lymphoid tissue cells. Following the vaccination with attenuated cultures of the micrococcus neoformans, we see the same cellular changes that follow exposure to the X-rays and other physical agents employed against cancer. Cellular necrobiosis, digestion of cellular debris by the phagocytes, the process of repair is always the same. Whatever be the nature of the lesion, be it a simple or an infected wound, a furuncle, a tuberculous lesion, be it a cancerous nodule, the human organism disposes of only one defensive process, phagocytosis. Chemiotaxis is positive or negative. When the army of pathogenic microbes multiply, the leucocytes begin the fight, and leucocytic victory results in cure, leucocytic defeat results in death.

Spontaneous destruction of the cancer cells by the phagocytes is exceptional. In fact, the polynuclear leucocytes which destroy so easily the micrococcus neoformans in the free state are incapable of destroying the cells which harbor it as a parasite, and even the macrophages are practically inactive in its presence.

Certain individuals possess a relative immunity against cancerous infection as can be observed in atrophic scirrhus cancer which is a cancer of slow evolution.

Is it possible to provoke artificially these phenomen a of regression? The problem does not seem incapable of solution. Cancer must be treated by local and by general measures. Extirpation with the knife is the favored treatment. Operation, though performed early, has given many disappointments. The frequency of rapid recurrence after apparently very complete operations, shows that cancer cannot be treated even in its beginning as a purely local affection. The cells through which repair of the operative wound is effected are powerless to devour the few cancerous cells that mayeescape from the tumor, and consequently these tumor-cells will graft themselves in the operative wound. Many patients, a few months after the removal of a cancer, are in far worse shape than if the tumor had been unchecked. Surgical intervention seems to have propagated the affection to the healthy tissues that limit the operative field. It is necessary that by an increased phagocystosis the resistance of the cancer cells be limited. All the local measures that are now employed against cancer, as for instance X-rays, radium, electric sparks, only produce a minimum effect, only slightly diminish the vitality of the cancer cells. It is indispensable to aid these agents with general treatment.

The resources which I employ against cancer are the following: Anti-neoplastic vaccination with cultures of the micrococcus neoformans. These vaccinations should be employed preventively in cases where there is a probability of cancerous degeneration. These vaccinations are employed without exception in all cases of cancer in which the diagnosis is positive. Second, the operation must not be performed before having subjected the patient to a series of immunizing infections. Third, the vitality and the virulence of cancerous cells, especially in cases of superficial lesions, must be lessened by physical agents of known activity, such as the X-rays, radium, electric sparks, either of high frequency or of great intensity, etc.

STATISTICS OF STOVAINE SPINAL AND COCAINE SPINAL ANESTHESIA

M. Sabadini, Alger. I have used stovaine spinal anesthesia in 156 operations. The cases have been of a varied nature; hernia, osteomyelitis, appendicitis, vesical calculi, ovarian cysts, prolapsus of the rectum, etc. Duration of the anesthesia varies from 15 minutes to an hour and a half. In $4\frac{1}{2}$ per cent of the cases, no anesthesia

was obtained. This lack of anesthesia is noted especially in neurotics and in alcoholics. The immediate accidents were headache and vomiting, and were of slight significance. Of late accidents, there were none. We always use Billon's stovaine. The dose varies from 5 to 10 centigrames. We have never had a death. Our conclusions are the following:

Stovaine spinal anesthesia is a good method. Like cocaine spinal anesthesia, it can be employed without danger from the 15th year up. The dose of stovaine to inject varies from between 5 to 10 centigrams. The anesthesia lasts up to one hour and a half. Unpleasant accidents are of less significance and of far less frequency in stovaine spinal anesthesia than in cocaine spinal anesthesia. One disagreeable effect of spinal stovaine anesthesia noted was the retention of urine. This occurred 44 times in 146 cases. This retention varied from one to several days. This inconvenience we have not noted in cocaine spinal anesthesia.

MIXED ANESTHESIA, OBTAINED BY SCOPOLAMINE, MORPHINE, AND CHLOROFORM

M. Cazin, Paris. In 243 operations one hour before beginning choloroformization, I injected a half a milligram of scopolamine and a half a centigram of morphine. I have never observed the slightest accident. In a general way, I can say that I have obtained more satisfactory anesthesia than if I had employed chloroform alone. I find the method especially valuable in impressionable patients. In them, the injection of scopolamine-morphine calms the apprehension and to a sensation of fear succeeds apathy. They do not seem to concern themselves with what is going on around them.

There is one thing positive and that is that scopolamine has marked action upon the heart. We think that in big doses its action upon the heart is dangerous. We would never give more than a half a milligram of scopolamine, and we think that it is desirable to even lessen that dose.

In the discussion which followed, several surgeons reported cases in which they had operated with scopolamine alone.

WOUND OF THE LUNG; PROBABLE WOUND OF THE HEART; IMMEDIATE OPERATION

M. Raymond, Paris. The patient was brought to the hospital in a collapsed condition. He had a gun-shot wound of the chest, small externally, and slightly above the left mamma. The diagnosis was hemo-thorax; probable wound of the heart. We turned back a flap of the chest wall, containing the fourth, fifth, and sixth ribs. The pleura was opened, the lung had been perforated. Pulmonary haemostasis. After displacing the pleural cul-de-sac outward, we incised the pericardium. There was a contused wound of the left ventricle. It was not perforating, however. We did not think it useful to suture the wound. No pericardial drainage. We drained the pleura. This occurred three years ago. The patient has remained cured.

M. Reverdin, Geneva. I have employed the technique used by Raymond and have been satisfied with the rapidity with which one can obtain access to the lesion. In my case, unfortunately, the pulmonary artery had been perforated and the patient died on the operating table.

M. Zawadski, Warsaw. I have had occasion to operate on 3 cases for wounds of the heart. In the first operation the pericardium was attacked. I sutured the pericardium. Recovery followed. In the second patient, there was a deep wound of the right ventricle. It was a stab-wound. I sutured. The patient lived 17 days and died of pneumonia.

The third case was an alcoholic, who while in a state of intoxication received a wound in pit of the stomach. The patient was in a state of collapse, pulse 180 filiform. Area of transverse dulness of the heart increased. Heart sounds feeble, anguish extreme. Extreme secondary anemia. I operated under ether anesthesia. I sutured the heart and also sutured the pericardium and placed a drain between the pericardium and muscular cutaneous flap. The patient lived, doing well for 15 days. On the 15th day, a visitor brought, unknown to the nurses, a quantity of wine and alcohol, which the patient drank. This was followed by vomiting and this by hemorrhage and death. The post-mortem showed that the two pleural cavities were intact. There was a suppurative inflammation of the pericardium. Sutures in the pericardium had yielded. There was a softening of the heart muscle in the neighborhood of the pericardial sutures. Death was due to cardiac rupture. (The heart was presented.)

I will conclude as follows: 1. In suspected wounds of the heart one must not hesitate to operate. Hemopericardium is not a contra-indication. These patients stand ether anesthesia well. Good exposure is obtained by removing from 6 to 9 centimeters of the 5th and 6th ribs, and by making temporary resection of the fourth. The pleural cavity is not to be opened. To stop the hemorrhage, which is always profuse, it suffices to displace the heart upward and a thing which is very interesting, the inferior portion of the heart can be compressed without stopping the function

of the heart. The continual activity of the heart may lead to infection if the wound be not entirely closed.

CONCERNING OVARIAN CASTRATION IN INOPERABLE CANCERS OF THE BREAST

HENRY REYNES, Marseilles. Four years after, recurrence. Failure of fulguration, that is of high tension electric sparks.

On the 20th of May, 1903, I performed a complete utero-ovarian castration in a young woman 32 years of age. This young woman was childless and had an inoperable bilateral cancer of the breast. Cancer was adherent to the thoracic wall. The auxiliary glands were involved on both sides. There was cachexia. The diagnosis of carcinoma was confirmed by Cornil. The effects of castration were remarkable from the local and from the general standpoint. There was a spontaneous healing of the ulcers, the tumor retroceded, and there was an atrophy of both breasts. For 3½ years the result was very satisfactory. Then recurrence occurred in both breasts. Despite X-ray therapy the disease progressed, and last February there were numerous cancerous ulcers on the right side involving the thoracic wall. These were present in the hard and in the soft tissues. On two occasions the cancer was curetted and subjected to high frequency and high tension sparks. The treatment proved inefficient. This interesting patient died on the 12th of July, 1907, due to cancerous cachexia four years after castration.

M. PSALTOFF, Smyrna. Three years ago, I did two total abdominal hysterectomies for cancer of the breast. The result of these operations was not encouraging. In the first case, owing to the involvement of the lymphatic nodes, the patient was thought inoperable by the usual methods, and we thought it would be a good case for abdominal hysterectomy and castration. We removed the uterus and adnexa. The operative recovery of the patient was uneventful. Two months after she died from the extension of the process.

The second patient presented a large tumor of the left breast. The lymphatic nodes were involved. The tumor was adherent to the thoracic wall. The tumor was inoperable. The uterus was removed with the adnexa. She made an uneventful recovery from the operation, but the tumor was not influenced in the least. Four months after she died. We think that it is well that all these cases be recorded.

THE EXCLUSION OF THE PYLORUS IN THE TREATMENT OF PYLORIC ULCER

M. JONNESCO, Bucharest. This was first suggested and employed by Von Eiselsberg. In the 4 cases which he reported (in 1895) 3 were markedly benefited by the operation; 1 died of hemorrhage 8 months after. In 1906 and 1907, I operated on 9 cases of pyloric and duodenal ulcers by this method. There were no operative deaths. One patient died on the 8th day of a severe intestinal hemorrhage, due to arteries at the base of the ulcer. Therapeutic results in all the above cases were excellent. All the symptoms rapidly disappeared, pain and the hemorrhage, the chemical composition of the gastric juice was always favorably influenced.

Exclusion is indicated in all spreading pyloric ulcers when pylorectomy is impossible. It is preferable to gastro-enterostomy, which has shown itself powerless against pain and hemorrhage and which has shown itself also incapable of modifying the chemical composition of the gastric juice. All those disturbances which are favored by the presence of the ulcer are largely influenced and stopped by exclusion of the pylorus followed by gastro-enterostomy. This operation prevents the ulcer from causing any harm and allows it to evolute towards a cicatrization.

The operative technique is immediate median supra-umbilical laparotomy, separation of the gastro-iliac and gastro-hepatic ligaments. Ligation of the coronary arteries along the greater and the lesser curvature. On each side of the future resection of the stomach, place curved forceps so as to prevent the escape of gastric contents into the peritoneal cavity. Resect the stomach with strong scissors. The pre-pyloric orifice is closed first, then the stomachic orifice. Close with three layers of sutures; one mucous, one musculo-serus, and the third is a sero-serus suture. Retrocolic gastro-enterostomy does not consume over 30 or 40 minutes.

STENOSIS OF THE PYLORUS, GASTRIC INANITION, GASTRO-ENTEROSTOMY, CURE.

M. VORONOFF, Cairo. This patient had frequent hematamesis for the six months which preceded operation. Symptoms of pyloric stenosis and spasm of the pylorus then appeared. Intolerance of food became more and more marked. In the last two months the patient could not even keep a few mouthfuls of water. The operation was performed at a time when the patient seemed on the verge of death from inanition. Precolic anterior gastro-enterostomy was the operation performed. Feeding began the second day after the operation. Complete disappearance of vomiting and of pain. Rapid return to health. Two months after operation the patient resumed her usual occupation.

A CONTRIBUTION TO THE STUDY OF TETANY AND OF CONTRACTURES OF GASTRIC AND INTESTINAL ORIGIN.

M. SCHWARTS, Paris. The patient entered my service; the diagnosis was gastric ulcer. This patient had painful contractures of all the abdominal muscles. These contractions were intermittent. There had been an aggravation for the last 6 months. I did an exploratory laparotomy and gastro-enterostomy by von Hacker's method. Its result was almost a resurrection for this patient. There was an immediate and complete disappearance of the abdominal contractures. On the 7th day this patient developed pneumonia and died on the 11th day. Post-mortem showed that there were in the duodenum several healed ulcers and one spreading ulcer which had destroyed the mucosa extending as far as the muscular layer.

BILIARY LITHIASIS; 16 KEHR OPERATIONS.

M. PAUCHIET, Amiens. Every case of biliary calculi should be operated. Elimination by the natural channels should not be sought as there is a danger of producing a permanent biliary retention, owing to appearance of calculus in the common duct. Acute calculous cholecystitis, with muco-purulent distention of the gall-bladder, will be treated with cholecystostomy. Chronic calculous cholecystitis, should be treated by cholecystectomy. Lithiasis of the common duct must be treated by the operation of Kehr. In non-icteric patients the operation has a very low mortality. The icteric patients often die of extreme icterus or of hemorrhage. In two-thirds of the cases of stone in the common duct, jaundice is absent.

I have practiced 16 operations with 3 deaths. I believe that in all cases of simple cholecystostomy, the biliary channels should be catheterized. Calculi may have been overlooked in the common duct. In draining the hepatic ducts, the subhepatic space must be tamponed and the wound of the common duct must be kept open for secondary elimination of biliary calculi. In feeble subjects, drain the hepatic ducts and the common duct. The latter drain will go into the duodenum and will allow the injection, in spite of vomiting, of sweetened water and of bile.

SPONTANEOUS RUPTURES OF THE GALL-BLADDER

M. MAIRE, Vichy. The first case is that of a patient 63 years old. She gave no history of gall-bladder disturbance. A phlegmon of the abdominal wall, the center of which corresponded to the umbilicus, developed. While scrubbing the field, previous to the operation, the wall ruptured and a few gall-stones escaped. The gall-bladder, cystic duct, a part of the great omentum, and a portion of the abdominal wall were removed. The gall-bladder contained 383 calculi. Recovery. The second case is that of a patient 56 years old, who gave a history of gall-bladder disturbance. In this case, the gall-bladder spontaneously ruptured and flooded the abdominal cavity. He died. The diagnosis was made but the patient could not be operated on until 10 days later. As symptoms of rupture of the biliary channels, I consider important a belt-shaped area of intense pain, occurring during an attack of biliary colic, with the appearance of jaundice of all teguments and gradual subsidence of the pain.

APPENDICULAR ILIOPSOITIS

M. LARDENNOIS, Reims. I report 2 cases of appendicular iliopsoitis. In one of them, the patient had four recurring attacks of suppurative psoitis without a sign of appendicitis. The removal of the vermiform appendix showed that the extremity of this organ penetrated under the iliac fascia and was in direct contact with the muscular fibres. It is unusual to have a left-sided psoitis. When it does occur, it occurs chiefly in women and is secondary to pelvic suppuration.

I wish to state that psoitis is usually due to an extension of an inflammatory process. This inflammatory process is almost always a latent appendicitis — an appendicitis which has not been diagnosed because it is retrocaecal. Since psoitis is usually of appendicular origin, the surgeon will not only drain the suppurative focus in the psoas, but will also suppress the causal affection, that is, the appendicular focus.

LIPOMA OF THE PELVIS OF THE RIGHT KIDNEY

M. CROISIER, Blois. For the last two months this patient had daily profuse hematuria. She was extremely anemic. The entire right side was the seat of pain. The right kidney was lowered and big. No other symptom was present. The urine examined microscopically showed numerous red blood corpuscles and also a large number of staphylocci en masse. There was nothing to lead one to suspect tuberculosis or cancer. The patient was 34 years old. Her condition necessitated an intervention, though no positive diagnosis could be made. Such a vague diagnosis as a renal tumor was permissible. At operation, upon the posterior surface of the kidney was seen a lipoma, the origin of which was the anterior wall of the pelvis. This lipoma traversed the pelvis. The tumor was removed. The point

of implantation was cauterized and the defect in kidney tissue was obliterated by sutures. The patient entirely recovered, hematuria disappeared immediately, the urine ceased to contain pus on the 8th day. An isolated lipoma is a rare occurrence in the pelvis of an otherwise healthy kidney.

VAGINAL HYSTERECTOMY FOR FIBROMATA

M. LeBec, Paris. I have performed 490 hysterectomies for fibromata; 310 abdominal and 180 vaginal. Although vaginal hysterectomy has lost its popularity, it still has indications. For instance, in all fibromata, the upper border of which does not extend beyond a point midway the symphasis pubis and the umbilicus, it gives a rapid cure. It avoids the abdominal cicatrix and does not expose to hernia formation. In 180 vaginal hysterectomies, I had 10 deaths. They were due to the following causes:

Two from hemorrhage, 3 from exhaustion, 3 from acute septicemia, 1 from emboli, 1 from uremia.

DIAGNOSTIC ERRORS DUE TO FAULTY INTERPRETATION OF X-RAY SKIAGRAMS

M. J. L. Championnière, Paris. The interpretation of X-ray pictures may give birth to errors. They may be poorly made, and thereby deform the object the same as a simple photograph can give a modified resemblance. Even with the best intentions and best environments on the part of the operator, we must acknowledge that the X-ray picture is profoundly modified by the situation of the bulb and the distance of the plate from the body. This led to the adoption of general rules for the situation of the bulb and the distance of the plate. But it is difficult to apply these rules to a focus the limits of which are difficult to precisely circumscribe. In some cases, the diagram may not show the fracture line. I have seen several fractures of the fibula in which this accident occurred. In some cases, it was only by repeating the exposures that the fracture was discovered. In some few cases, the rays did not show the fracture-line, though the symptoms were very characteristic. The transparency of the callus may explain some errors. If the X-ray picture is in contradiction with the symptoms, the cause of this contradiction must be determined and the exposures must be multiplied. To diagnose a fracture, you must get a definite line. A simple shadow is not sufficient. The causes that can cause projections of shadows are multiple.

TREATMENT OF ARTICULAR AND OSSEOUS TUBERCULOSIS

M. Mencière, Reims. I believe that local treatment is very efficient and I think it is essential. Sea shore and altitudes are only of secondary importance. I wish to insist upon the fact that the physician must be convinced that local tuberculosis is curable. There is no specific climate. Intra-articular and interstitial injections of the solution of iodoform in ether and phenolization are important measures. I report 86 cases, 23 consecutive cases of injection of iodoformized ether, with 23 cures; 63 observations of phenolization and phenopuncture with or without iodoformized ether injections. Nine cases I will not consider for diverse reasons. There remain 54 observations with 51 cures and cured without shortening. We must deduct 14 cases in which the method was employed for lesions other than joint tuberculosis. There remain 37 cases of joint tuberculosis. In these 37 cures, there were 15 cases of cure with remaining motion.

THE DIFFERENT VARIETIES OF CONGENITAL DISLOCATION OF THE HIP

M. Froehlich, Nancy. I divide the so-called congenital dislocations of the hip into three groups: 1. Congenital traumatic dislocation with normal cavities. 2. Teratologic dislocations. In this case there is primary malformation of the joint. This is the most numerous group. 3. Pathological or acquired dislocations.

In the first dislocations, enter all those that are produced during the intra-uterine period. They may be due to uterine compression; may be due to the presence of a limited amount of liquor-amnii; may be due to an exaggerated abduction of the femur and to the action of the pelvic-crural muscles, completing the displacement. Fall of the mother upon her stomach can dislocate a fetal femur. The dislocation may occur during delivery.

In the second class are included all those cases where there is an atrophy or a complete absence of the acetabular cavity, hence impossibility or a difficulty for the femoral head to lodge therein.

In the third class, the author includes all dislocations that are produced in the first months after birth, following arthritis of the hip joint; for instance suppurative arthritis, arthritis deformans, osteomyelitis of ilium, or of neck of femur. In the first class perfect cure is obtained as a rule. In the second and third groups cures are less frequent, improvements are numerous, there are failures.

I base this classification upon 74 personal cases, 23 of the first, 51 of the second, and 12 of the third group. This classification is based chiefly upon skiagraphy, clinical study, and therapeutic results.

M. Calot, Berck. . It is necessary to begin to give congenital hip dislocation attention soon after

birth. By operating as soon as the diagnosis is made, constant and complete cures can be obtained. To support my opinion, I have the pleasure of presenting 30 or 40 children which I have operated upon for congenital hip disease and who walk and jump so perfectly that it would be impossible to recognize any trace of their former deformity. I show you at the same time the X-rays taken before and after treatment.

RATIONAL TREATMENT OF CONGENITAL HIP DISEASE

M. LeDamany, Rennes. The mobilizing apparatus employed by Lorenz and his imitators must be improved and completed by a mobilizing and corrective treatment. I present for your consideration an apparatus which realizes these two aims. Through mobilization the cotyloid activity is more quickly and more deeply hollowed. After the correction of the causal defect, relaxation becomes impossible. The only disadvantages of this new method are that it requires a special apprenticeship and special tools. The results are far better than those secured by other forms of treatment.

M. Judet, Paris. Since 1902, I have operated on 50 cases of congenital hip disease. At the onset, I made use of Brun's three-step operation. I treated 19 cases. I obtained 11 anterior transpositions, 7 anatomical reductions, and had one failure, but the results which I obtained by the method which I am going to expose are very much better, and in the treatment of 18 cases I had 17 anatomical reductions and 1 anterior transposition. This series concerns children from 3 to 6 years old, showing complete dislocation and a shortening of from 3 to 4 centimeters. They are the most favorable cases. These patients have all been cured by a single apparatus which was removed at the expiration of 5 months. This plaster-of-paris apparatus immobilizes the femur in a position of flexion (90°) upon the pelvis, and an incomplete abduction 60°. I do not rupture the adductors. After a stay in the apparatus for a few months, the young patient begins to walk.

This method is applicable in single and in double dislocations. After these latter have been immobilized for 5 months, the patient can begin to walk at the close of the 6th month, and be completely cured in 8 months. The X-rays which I pass around illustrate successful cases.

In children from 6 to 12 years of age, two apparatuses must be used. The first apparatus will maintain the limb in flexion abduction and outward rotation; the second keeps it abducted and internally rotated.

THE ATROPHIC LENGTHENING OF THE BONES OF THE INFERIOR EXTREMITY IN TUBERCULOSIS OF THE KNEE IN CHILDREN.

M. Barbarin, Paris. Outside of the vicious attitudes, caused by a muscular spasm, the deviations from the normal of the inferior extremities in tuberculosis of the knee, are due either to destruction or to atrophy of the femoral epiphysis. If we examine these knees with X-rays at the onset, it will be noted, in the majority of the cases, that the femoral and the tibial diaphysis are thinned, while the diseased epiphysis are broader than normal. This atrophic lengthening, as it was called by Ollier, may be minimal, or may be very marked. Ollier, among many others, has reported cases of lengthening of the inferior extremity following tuberculosis of the knee. Menard, Burnoir, in 20 observations noticed an increase in length of the femur or of the tibia in 17 cases. In 32 cases of tumor albus, there was lengthening in 20 cases. This lengthening is usually of several millimeters. Bourganel has recently published a case where the lengthening was 4 centimeters.

I can show you the X-ray of a child of 3 years, where the lengthening was 3 centimeters. This lengthening usually involves the femur. How can this epiphyseal overgrowth be explained. To me, the following explanation appears the best: The epiphysis being congested and irradiated, the dia-epiphyseal cartilage becomes the seat of more rapid bone production. If this abnormal growth influences the entire epiphysis there will be an increase in the lengthening of the extremity, but there will be no deviation of the limb. If this abnormal growth involves only the internal condyle of the femur, genu valgum will result. In all cases, the knee must be fixed and protected. Radiography will inform the attending physician as to the condition of the epiphysis and will direct him as to the choice of apparatus.

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TECHNICAL METHODS OF PERFORMING CERTAIN CRANIAL OPERATIONS[1]

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IT has perhaps been for the ultimate good of cerebral surgery that the wave of enthusiasm in regard to operations on the brain, which followed the first adoption of Lister's new principles, subsided as rapidly as it did, leaving in its wake the lingering impression with most surgeons, and more physicians, that little or nothing was to be expected in the way of surgical treatment for cerebral maladies. Instead of proving a cure-all for tumor, for epilepsy, for hydrocephalus, for meningitis, and the like, surgery cured nothing.

From our present vantage ground, the futile, often disastrous, attempts of earlier days no longer occasion surprise, many factors serving to explain why they were so numerous — an imperfect idea of cerebral localization, indeed localization of function even doubted by many; an imperfect knowledge of the physiology of the intracranial space, of the functions of the cerebrospinal fluid circulation, of the phenomena of compression, of the difference between anatomical lesions of nerve tracts and their simple physiological blocking from pressure, from œdema and the like; and lastly — until the method of osteoplastic resection became perfected — most unsatisfactory ways of exploring the cranial chamber.

The "surgery of the head" became, as of old, largely confined to the treatment of traumatic injuries of the skull; and here, except in the matter of cleanliness, little has actually been added to the knowledge possessed by Hippocrates, or Ambrose Paré, or Percival Pott. Operations again became limited in large measure to the direct treatment of indented fractures of the vault — a dull matter, relieved only by an occasional brilliant case of removal of an extradural clot or the successful drainage of a cerebral abscess of otitic origin.

These things, perhaps, may account for the fact that, in most of our text-books, the surgery of the head is principally devoted to the surgery of cranial fractures; whereas, in matter of fact, these lesions of the bones themselves are only of import in accordance with the damage they have done directly or indirectly to the brain. Thus, for example, in fractures of the cranial base, we hear much of the mechanism of their production, and the external evidences of their presence, but surgeons are far from any uniform agreement in regard to the treatment of the diffuse hæmorrhages and œdema, the cause of the uniformly high mortality in these cases.

Meanwhile, however, through the persistent efforts, particularly of a few men — Bergmann, Kocher, D'Antona, Keen, Krause and Chipault, to mention a few of the leaders, men who have not only shown especial aptitude for neurological operations, but, what is more

[1] Read before the St. Louis Surgical Society, December 10, [illegible]. Certain paragraphs in this article [illegible] the views expressed in [illegible]

important, who have had some neurological training — a steady advance in technical methods has kept pace with the progress in our anatomical and physiological knowledge of the nervous system.

It is interesting to compare the exploratory operation of to-day — let us say, in illustration, for a cerebral tumor — conducted through a large osteoplastic opening, the procedure often carried out in two stages, possibly with a preliminary decompressive operation in a situation away from that of the suspected growth, in order to give temporary relief from symptoms:— it is interesting to compare such an operation with the explorations which used to be made through a simple trephine opening placed, for example, at a spot previously determined by careful extracranial measurements on the scalp, so as to bring into view the cortical centres for movements of the thumb; whereas the exact physiological situation of these centres on the cortex had not even been determined — in fact, was not determined until the investigations of Sherrington and Grünbaum in 1900.

Although there is evidence at the present day of a certain rebirth or reawakening of interest in matters relating to this important field of surgery, there can be no doubt but that, owing to the need not only of particular technical training, but also of wide neurological experience, the advances, for the time being, must continue to be made largely at the hands of a few men who choose to devote themselves to this, and to exclude themselves from other fields of operative work. The day will doubtless come, as has been the case with all surgical specialties, when matters of operative therapy will be put upon a sound basis for certain conditions, and will be shown to be futile in others; and when this time comes, then may the general surgeon properly and safely undertake to practise these measures and include them among his numerous daily operations.

In the meantime, there is much to be learned in regard to the cerebrospinal fluid circulation before the treatment of cerebrospinal infections, or of acquired and chronic hydrocephalus, can be dealt with; much to be learned in regard to intracranial pressure before we can finally determine the best method of decompression for inaccessible tumors, for the œdema of uremia, the swelling associated with cerebral softening, with encephalitis, with the so-called meningitis serosa, etc; in regard to cerebral hæmorrhages before we can finally come to remove apoplectic clots as safely as we can those from the meningeal spaces; and in regard to many other of the diverse problems which come before the operating neurologist

We are at present making a beginning only, and it will be some time before the general surgeon can afford, with the present large chances of failure, to undertake these very difficult procedures, the success of which depends upon an expenditure of time on individual cases in operating room, ward, and library, which cannot be spared without an almost complete sacrifice of other more usual forms of surgical work.

On this particular occasion, however, I purpose to limit my remarks largely to a description of such technical methods as have come to be more or less habitual, in Dr. Halsted's clinic with which I am associated, in the routine performance of the simpler operations of craniotomy and craniectomy — in other words, of operations in which a portion of the skull is but temporarily displaced, usually for the primary object of intracranial exploration, and those in which it is with forethought removed, usually for purposes of cerebral decompression.

Many of the views to be expressed are purely personal ones and are given with the full realization that the details of preparation and procedure which prove satisfactory to one may be entirely unsuited to the operative requirements of another. Special training and familiarity with a given set of instruments engenders facility in their use; unfamiliarity even with a better tool, awkwardness.

From a purely technical point of view we are more indebted to the method of temporary osteoplastic resection, first attempted by Wagner[1] in 1889, than to any other factor for the satisfactoriness of most of our present-day operations on the cerebral hemispheres. These

[1] W. Wagner: Die temporäre Resection des Schädeldaches an Stelle der Trepanation. Cent. f. Chirurgie, 1889, S. 21, p. 33.

trap-doors may be cut from the cranium with a variety of tools; the simplest armamentarium is a mallet and chisel, the most elaborate, a motor, with its trephines, burrs and saws, driven by electricity. They have both been employed at the hands of their chief advocates with great skill, but they are unsuited to the needs of the many.

Simplicity is a desirable quality in operative technique, but the blows of a mallet, even though transmitted in a glancing direction, are undesirable; and speed, the chief advantage of the moter-driven rotary tools, is invariably a source of danger, even in accustomed hands. It really matters little, except in saving time for the surgeon, whether an osteoplastic flap can be elevated by one method in seven minutes, or whether another requires twenty; and an operator who persists in taking dangerous corners at high speed will be the cause of a serious or fatal accident some day, whether he is driving an automobile or opening a skull. For in the more rapid operation, should dura or cortex happen to be injured at the time of making the bone incision, not only is the chance lessened of a successful outcome, particularly in cases with increased cerebral tension, but also time is actually lost. It is the hare and the tortoise over again.

Although the craniotomy is performed solely to give access to the lesion, whereas the actual operation is what is done to better the condition within the skull, nevertheless I shall dwell at this time merely upon safe methods of making the approach to the surface of the hemisphere, and I shall, perforce, have little to say in regard to the treatment of intracranial lesions themselves.

STEPS OF AN OSTEOPLASTIC RESECTION

Since this procedure may be taken as representative of any major operation on the skull, I shall, at the risk of being tedious, describe the general plan of preparation and performance to which I adhere, the resection itself being that which Da Costa has designated the "combined method"— a method which I feel sure is characterized, at least, by safety; and avoidance of operative accidents in the approach to a cerebral lesion is a matter of no little moment.

General preparation. It is, I believe, a fairly universal custom to have the patient's head shaved and treated antiseptically in the ward on the day before the operation — some even advocate a double preparation of this kind. This I consider an unnecessary precaution, if not positively unwise; for the patient is apt to pass an uncomfortable night and, even with the most expert shaving, the scalp is likely to be a little "sore" the morning of operation. In something over 350 craniotomies I have never seen an infection, even a superficial stitch abscess, and have ceased to regard the chance of sepsis as a possible complication of these operations.[1]

It is our custom, without previous ward preparation, to have the hair clipped and shaved just before the operation — a duty encumbent upon the surgeon himself, in the case of a child or a nervous patient. After a double shaving, once with and then against the direction of emergence of the hairs, there may be a preliminary cleansing of the scalp with green soap and a soft brush, the head then being wrapped in a towel wrung out of warm bichloride solution. The final preparation is deferred until after the anæsthetic.

Position on the table. It is a great advantage, though it does not appear to be a common practice, to place the patient on the table in the position most favorable for the operation before administering the anæsthetic. This shortens the time as well as the depth of anæsthetization, for a degree of narcosis greater than required for operative purposes is necessary before a patient can be moved from stretcher to table without upsetting an even respiration. It insures, furthermore, the patient's being in a comfortable posture, and thus obviates, in large measure, the strain leading to backache, and so forth, which an awkward position and the handling of a relaxed patient engenders. It is particularly important to follow this practice in case the cerebellum or occipital lobes are to be exposed.

Many operators have a particular form of

[1] The recent important discovery of Mr. S. J. Crowe, of our medical school, that formaldehyde is present in the cerebrospinal fluid after the administration of urotropin, might make its administration before the operation desirable in cases in which the possibility of a perfect technique is questionable. It certainly will prove to be a therapeutic agent of the greatest value in all cases in which there is an escape of cerebrospinal fluid after basilar fractures, meningeal wounds, etc.

head-rest for all cranial operations, table extensions for this purpose having been described by Horsley, Frazier, Morestin and others. For the usual operations on the vault, however, small, flat, solid pillows or sandbags seem to be all that are necessary to turn and hold the head in the desired position: on the other hand, I regard a head-extension with shoulder supports as essential for occipital work, chiefly to insure free respiration. Thus do surgeons' views differ. Whatever form of table be used, however, it is desirable to have the head-end capable of being raised or lowered at will.

The anæsthetic. Regardless of the drug to be employed, it is essential that it be administered by an expert — preferably by one who makes this his specialty. Many of the conditions for which these operations are attempted are associated with cardiovascular and respiratory disturbances of cerebral origin, and the greatest care must be exercised lest there be a further burden due to the anæsthetic. Cerebral surgery is no place for a "Guck in die Luft" anæsthetist.[1]

In all serious or questionable cases the patient's pulse and blood-pressure, their usual rate and level having been previously taken under normal ward conditions, should be followed throughout the entire procedure, and the observations recorded on a plotted chart. Only in this way can we gain any idea of physiological disturbances — whether given manipulations are leading to shock, whether there is a fall of blood-pressure from loss of blood, whether the slowed pulse is due to compression, and so on. A further safeguard is an artificial respiration apparatus, to be immediately put into use in case there is failure of an already burdened respiratory centre, either from the anæsthetic, from loss of blood, or from additional medullary pressure due to cerebral manipulation.

Sir Victor Horsley, as is well known, is a strong advocate of chloroform in combination with oxygen, and administered after a preliminary hypodermic of morphine. He emphasizes that only a small amount of the drug is required, except during the early and closing periods of the operation, and that there is less likelihood of vomiting than with ether. The drug thus combined is taken smoothly, without cyanosis, and, furthermore, tends to lower the blood pressure; hence there is said to be less bleeding during the operation.

In this country, where chloroform is doubtless administered less well than ether, the latter is the anæsthetic of choice at most hands, the primary stage usually being induced with ethyl chloride. Kocher believes that there is an element of risk in the lowered blood-pressure under chloroform, and it is perhaps debatable whether this is not a more certain danger than the somewhat greater loss of blood under ether — a drug which tends to hold the blood-pressure high.

The question of the anæsthetic in a two-stage operation is an especially serious one, and under these circumstances, the dangers from chloroform would possibly be less than those of a repeated etherization. Some years ago, however, having had a fatality from chloroform, I employ it far less frequently in cranial operations than ether, restricting its use largely to children.

Local anæsthesia may at times suffice, especially for such simple measures as ventricular puncture, though infiltration of the scalp is difficult. I have learned, furthermore, that in favorable cases no anæsthetic need be required in a second-stage operation limited to manipulations of dura and brain after re-reflecting an original bone-flap.[2]

Preparation of the operative field. With the patient anæsthetized and in proper position on the table the final cleansing is done; for this, alcohol and 1 to 1000 bichloride solution are sufficient.

It is my practice at this stage, before the landmarks are obscured by the covering of operative sheets and towels, to outline the proposed incision on the scalp by a superficial scratch with the scalpel.

[1] We have, of late, in all of our cerebral operations, followed the custom of having the etherizer constantly auscultate the heart. This is accomplished by strapping the transmitter of a phonendoscope to the precordium. From this a long tube passes to the aural receiver which is held against the auricle of the receiver of a telephone operator. This is much more satisfactory than the usual superficial cardiac action by the occasional palpation of the pulse for which a hand must be disengaged. It is surprising that the method has not come into general practice before this.

[2] Thomas and Cushing. Report of Fifty Surgical Cases [illegible]. A Second Stage Operation without Anæsthetic. J. A. M. A. February, 1908.

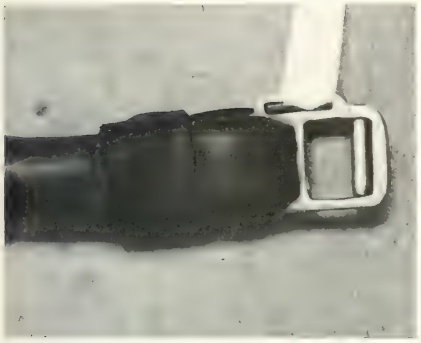

Fig. 1. Showing buckle of tourniquet, with slot for median tape and roller to allow of easy removal.

An operating neurologist should acquire the power of visualizing the brain, its main fissures, the insula, the ventricles, etc., through the intact skull; and those who have, by long practice, familiarized themselves with the rules of cranio-cerebral topography, learn to judge the position of the main fissures with no greater margin of error than when measurements are employed. Furthermore, as a large opening is to be made, an attempt to accurately determine on the scalp the point overlying a given centre, is to-day less essential than in the days when an attempt was made to approach it directly by a small overlying trephine opening.

Those who are less familiar with the relation of the superficial landmarks to the deeper structures, will need to mark out the main fissures by the aid of a craniometer, or by some one of the prescribed rules of measurement. As this is somewhat time-consuming many prefer, with an indelible pencil, to delineate these landmarks on the shaved scalp the day before. As a matter of fact, in osteoplastic work, even so delineated, these surface lines are not of great value particularly if the proposed flap is destined to include the Rolandic line; for most of the mark will be turned back with the flap, and the remaining fragment does not serve as a practical guide to the central fissure, even if it happens to have been accurately placed.

With the proposed flap thus outlined and the head raised by an attendant's hand placed under the back of the neck, a broad square of wet bichloride gauze is thrown over the entire head; over this, in turn, is placed a *tourniquet*.

For the *control of hæmorrhage from the scalp* numerous forms of tourniquet have been advocated. Many use a simple rubber tube, or Esmark bandage, both of which are difficult to apply and to fasten without slips in the aseptic technique. Crile has employed a rubber dam which, being stretched over the entire scalp, renders it bloodless. I formerly used a pneumatic tourniquet, but have finally come to a form of rubber ring in which is inserted a buckle (Fig. 1), so that the tube can be made into a ring of any size and can be easily removed at the end of the operation. Practice enables one, with a given quality of tubing, to estimate the size of the ring, necessary in a given case, to shut off arterial supply from the scalp without causing undue pressure. The ring, furthermore, is provided with a median tape (Fig. 2), whose length — measured after the head is shaved — should equal the

Fig. 2. Adjustable cranial tourniquet, with tapes applied.

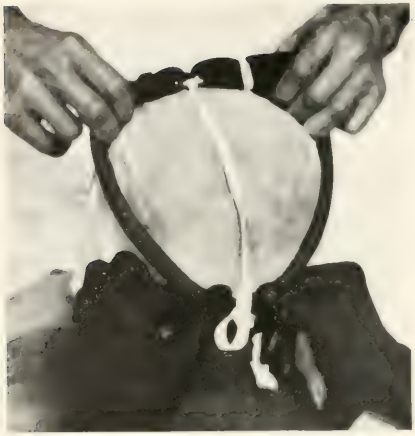

Fig. 3. Showing application of tourniquet. Point diametrically opposite to buckle held below inion by assistant while circle is stretched over head, buckle being prevented by tape from overriding glabella.

distance from glabella to inion, and the object of which is to prevent the ring from rolling over the orbits, as it is likely to do, especially if there is a prominent forehead. Having been boiled, the ring is applied by the operator and an assistant (Fig. 3), being snapped over the head from occipital to frontal regions (Fig. 4).

In the majority of cases all bleeding from the scalp is thus controlled, though in certain patients with tumor, in whom there is marked intracranial stasis, some of the veins on the concave side of the incision which receive blood through emissary vessels from within the skull may have to be clamped. Special broad forceps have been designed for this purpose by Nicholson, Howzel and Chipault.

Other means of preventing loss of blood from the scalp have been advocated; as, 1. A preliminary ligation or clamping of the carotid; 2. The blocking by three mass tissue ligatures, including, respectively, temporal, occipital and supraorbital arteries; and 3. The enclosure of the proposed incision by a running suture passed through the scalp on each side of it with the purpose of leaving an anæmic strip of tissue (Heidenhain). They are not to be recommended.

Around and just above the tourniquet a small towel, folded lengthwise and wet in bichloride, is tightly pinned, and to this is securely fastened the large sheet which covers the etherizer like a tent and leaves exposed little more than the area outlined by the preliminary incision (Figs. 5-6). If there is any likelihood of the slipping of these surrounding sheets, they may even be pinned directly into the scalp. Thus can one be assured that there will be no break in technique from outside sources during what may prove to be a long operation.

Such details of preparation are of especial importance, I believe, in operations whose approach lies toward the base of the skull; for example, in the suboccipital or temporal operations to be described. In those situations away from the vault, the use of a tourniquet is, of course, impracticable, and as the operations may be prolonged, as in Gasserian ganglion work, or in the exposure of lateral recess tumors, it is essential that the exposed skin field, which may be only a few square inches in size, should be securely isolated from its questionably clean neighborhood.

The osteoplastic flap. With the operative field thus prepared, the incision is carried down to the skull, through gauze and soft parts, in the line previously scratched on the scalp. When the bone has been exposed it can be opened in a number of different ways.

It may be recalled that in the original operation described by Wagner the flap was outlined with mallet and a bayonet-pointed chisel; Chipault, Keen and

Fig. 4. Cranial tourniquet in position over gauze cap.

Fig. 5. Fig. 6.

Figs. 5 and 6. Showing final preparation of operative field with board for anesthetist

others followed his lead. Dr. Keen long used a particular form of grooved chisel, with which the incision was quickly made through the greater thickness of the skull, the flap being finally loosened by a few strokes which served to break such portions of the inner table as had escaped division. Küster has recently devised a chisel of different form for the same purpose. Most operators object to these methods, on the score of possible concussion, even from the glancing blows which are given.

Toison, in 1891, suggested dividing the bone with a chain saw passed between primary trephine openings, so that *the bone should be cut from within outward*, and this remains, I think, a first principle to be employed, when possible, for all cranial incisions. Obalinski, in 1897, recommended for this purpose the flexible wire saw introduced, for obstetrical purposes, by Gigli [1] in the same year.

Similarly the bone may be cut between the primary openings by sawing with a straight hand-saw from without inward, and Doyen has devised a special saw with a guard for this purpose. It is a dangerous method in inexperienced hands.

Further, a linear cut from 2 to 3 mm. wide, of the full thickness of the bone, may be made with biting forceps of the Montenovesi or of the Dahlgren and De Vilbiss patterns. These instruments progress slowly, but they are almost certain not to injure the dura and have the advantage of biting outward, so that there is little, if any, jar to the brain.

There are, further, certain craniotomes which cut in a circular fashion by swinging the blade about a fixed point, and which may be used to incise scalp as well as bone. The Stellwag n instrument has been highly praised by Philadelphia surgeons. A French instrument of similar type was described by Codivilla in 1900. Though no preliminary trephine opening is needed, these methods, likewise, possess the disadvantage of cutting from without inward, and as there is no guard, the dura is likely to be injured by these *craniotomes à mouvement circulaire*, unless the membrane is approached with the greatest caution.

The electromotor,[2] following upon its introduction into dental surgery, has been employed to furnish the driving power for a number of instruments which possess a circular or spherical form and so can revolve, such as burrs, trephines and circular saws, of which there are a number of patterns —Van Arsdale's, Powell's, Marsland's and Doyen's; and it has led to the invention of a revolving tool with spiral cutting edges, which is used by some operators. Cryer in 1898, Sudeck in 1900, and Sykes have all described instruments of the latter type, and while they are useful for certain purposes they possess the disadvantage, for osteoplastic work, of cutting such a wide slot that, when used for the entire incision, the replaced flap subsequently rests on the dura instead of on the bone edges.

In the Doyen type of motor there is a long, flexible arm between the motor and the revolving tool, which is thus driven from a distance as in the usual form of dental engine. Borchardt (1906) has made some

[1] Gigli's saw was merely an improvement on the *scie japonaise* introduced by Kusy in 1876; this, in turn, having been a modification of the ingenious old chain saws devised by Aitken.

[2] It was the electromotor which made practicable the principles of Charrière's winding-machine (*scie à mollette*), Ollier's *scie à volant et à transmission élastique*, and Martin's four-handed brace and bit. The latter, in particular, though a hand-driven instrument, has all the accessories of the most modern equipment, including rotary saws and hollow mushroom-shaped burrs —tools more recently adopted and perfected by Doyen

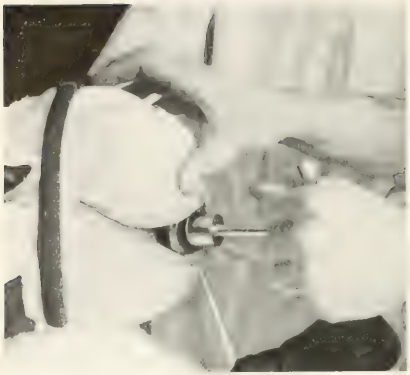

Fig. 7. Exposure of skull by retracting outer edge of incision downward, to give room for primary large trephine opening at the posterior upper angle of proposed flap.

desirable modifications of this apparatus, and Bercut (1904) and Hartley (1907) have added the great improvement of having a cutting tool directly connected with the motor, which, weighing only eight or nine pounds, and being capable of sterilization, is itself held in the operator's hands. Hartley has also devised new forms of perforators with serrated edges.

Surgeons who use electromotive force for osteoplastic operations are able to work very rapidly, and, if this does not mean added risk of accident, it is most desirable. However, having witnessed in skilled hands, twice from a Doyen saw and once from a Cryer drill, what I regard as a most serious accident — namely, the division of bone and dura at the same time owing to the fact that the guide of the speeding instrument worked its way through the adherent membrane instead of separating it from the skull — I have clung to the somewhat slower, but certainly less dangerous operation by hand-driven instruments.

The "combined method," to be described, makes use of the following general principles: 1. Division of the bone between two or more primary openings (Toison). 2. Incision by an advancing instrument from a simple opening. 3. The making of all cuts from within outward. 4. The leaving of a beveled flap.

A primary opening through the thickest part of the exposed cranium, usually near the parietal eminence, is made with a hand-tre-trephine (Fig. 7), which should be of generous size, with a crown fully 2 cm. in diameter. I prefer a trephine of the Galt conical pattern with beveled sides (Figs. 8-9); it is the safest instrument and obviates the necessity of an extractor (*tire-jond*) for the button, for this can be tilted out owing to the width of the superficial cut. Bleeding from diploëtic vessels, in certain cases of tumor, may be severe; a fatal case, indeed, of this sort has been reported by Ransahoff. It may be controlled by the proper use of Horsley's wax, with which the beveled teeth of the trephine may be filled.

One or more secondary openings (one is usually sufficient) at the upper edge of the incision are made with a Doyen perforator and burr (Fig. 10). Then, with a long-handled blunt dissector or dural separator, introduced through the large trephine opening, the dura between these openings is freed from its bony attachments. On withdrawing the dissector the cerebral pressure, in most cases, suffices to hold dura against bone again, and thus serves to control such bleeding as may have been occasioned.

From these two primary trephine openings the lateral edges of the flap are then cut downward toward the base in a line concentric with the skin incision. The first half-inch of these lateral cuts is made with Montenovesi forceps (Fig. 12), which leave a 2.5 mm. incision, followed by the weaker Dahlgren forceps (Fig. 11) as the thinner bone near the temporal region is approached.

A Gigli wire saw is then passed on a guide, of which there are numerous forms, between the two openings and the mesial edge of the flap is cut on a broad bevel (Figs. 13 and 14)

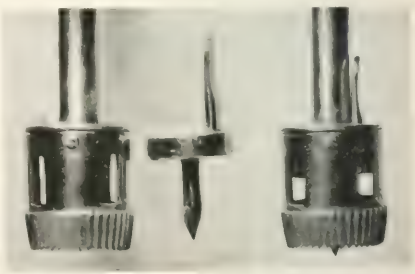

Fig. 8. Fig. 9.

Figs. 8 and 9. Crown of beveled trephine with loose central pin, having thumb-piece to prevent its dropping out unless desired.

Fig. 10. Doyen burr, which should follow a perforator: in use during operation to make opening at anterior angle of proposed flap.

Fig. 12. Montenovesi forceps in use, starting lateral

Fig. 11. Dahlgren forceps used for incision of lateral edges of bone flap, when approaching thinner portion of cranium in temporal region.

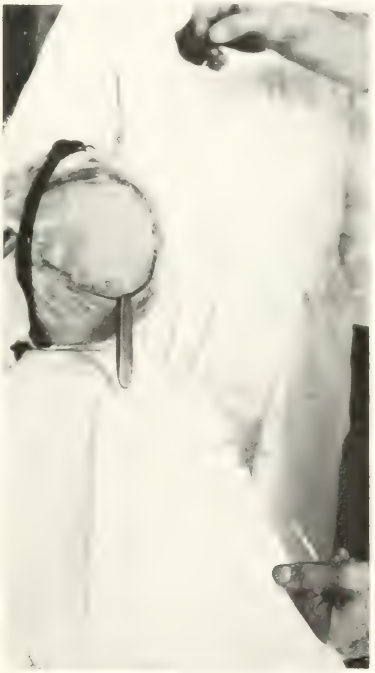

Fig. 13. Showing Gigli wire saw in use for making beveled mesial edge of flap, with dural guard introduced through the two cranial openings.

Fig. 14. Showing same stage of actual operation. Note dryness of field, owing to properly applied tourniquet.

(this is an important detail, for it enables the subsequent solid replacement of the flap without danger of its being driven inward by a snug pressure-bandage). The flap is then forced back by the insertion of blunt instruments around the edges, and is broken across at its base (Fig. 15).

As Hartley and Kenyon have emphasized, all flaps made on the cranial vault should radiate toward the temporal wing as a base, since this is the thinnest part of the calvarium, is most easily broken, and its covering of scalp is well nourished by the temporal vessels.

Fig. 15. Bone-flap reflected, exposing dura. Note bevel of upper edge of bone-flap.

Provided the flap includes the region of the pterion, the meningeal artery may be torn owing to its having channeled the broken bone. The vessel should be ligated at its lowest point of exposure by making at a distance a small opening in the dura, through which a grooved director can be inserted; on this the curved needle may be passed without danger of injuring even a tense cortex. Bleeding from the expansions of the lateral sinus, in case they have been exposed by a high flap, is best controlled by the pressure of sterile absorbant

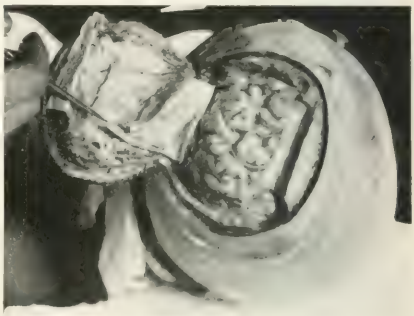

Fig. 16. Osteoplastic flap and dura reflected. Note concentric rather than superimposed openings through scalp, cranium and dura.

cotton, pledgets of which I find to be as valuable, as a hæmostatic agent for the intracranial part of the work, as is wax for the bone itself. Horsley prefers hot saline or weak bichloride irrigations for this purpose.

The intracranial procedures. At this stage, if there has been a fall of arterial tension from loss of blood, the further progress of the operation, especially in tumor cases, may well be postponed for a second session. If there is no contra-indication on this score, the dura is opened in a line concentric with the bone incision (Fig. 16), leaving plenty of margin for subsequent suture. The membrane should be incised on a grooved director, especially if there is increased tension, for it is very important to avoid any possible injury to the pia-arachnoid. In case the tension is so great as to threaten this, a lumbar puncture should be performed at this stage of the operation.

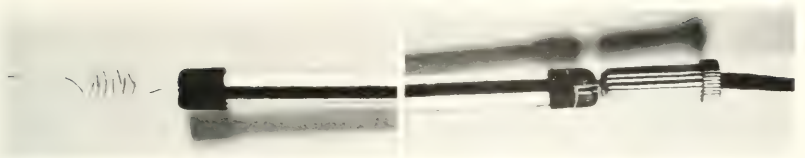

Fig. 17. Showing terminal and connection of author's electrode. (Natural size.) Instrument should be 16 inches or more in length.

The dural incision should not be made too near the median line, lest the edge of the parasinoidal expansions, or the veins entering them, be injured. If the mesial edge of the hemisphere is to be exposed it is best to open the dura in this direction by a separate radial cut, and if necessary to rongeur away some of the bone toward the median line. This is preferable to an attempt at exposure of the mesial edge (foot area) through the primary osteoplastic flap — a procedure usually attended with great loss of blood.

If the expected lesion is not disclosed and if the topography is not perfectly clear, the fissura centralis may have to be determined by faradization of the cortex. A long glass unipolar electrode (Fig. 17), carrying a fine platinum core coiled into a spiral at the end, according to Sherrington's plan, in order to obviate puncturing the pia-arachnoid, is used for stimulation. The other pole is attached to an extremity, preferably on the homolateral side. The current should be just strong enough to contract exposed muscle — some of the temporal fibres are usually available for this purpose. If there is an abundance of cerebrospinal fluid in the arachnoid spaces, it must be evacuated by pricking the membrane as it bridges the sulci, and further, the patient must not be too deeply under the anæsthetic. No motor cortex, unless there is complete degeneration of the pyramidal tract, fails to give responses if these precautions are observed.

If an incision of the cortex is necessary, whether for exploration, for extirpation of a given area in cases of focal epilepsy, or for the removal of a neoplasm, such cortical vessels as will evidently have to be divided must first be ligated on each side of the proposed incision, which should, if possible, be confined to the exposed surface of a convolution, and should not cross a sulcus. The finest strands of split silk, preferably black, should be used for these ligatures, and they should be passed around the vessels with delicate curved French needles, which are introduced and emerge in non-vascular areas. With these precautions, the subcortical manipulations can usually be conducted with but little loss of blood even in most cases of tumor extirpation. Tumors which have approached and involved the cortex must be surrounded by a similarly placed double row of ligatures, between which the incision is made. Subsequent dissections are carried out with blunt instruments, and the momentary pressure of cotton pledgets will usually check the oozing.

A brain which tends to protrude may sometimes be "dropped back" by elevation of the head and trunk, or by evacuating cerebrospinal fluid. This can at times be accomplished by pricking the exposed arachnoid spaces and by milking out the fluid; at other times a lumbar puncture may be necessary, and the removal of fluid in this way during the course of an operation is of the greatest possible help under many circumstances, being in large measure free from the dangers which attend a similar proceeding in the presence of great cerebral pressure when the skull is closed.

Closure. Unless there is reason for permanent decompression, in which case the dura somewhere should remain open, an accurate approximation of the membrane in its two layers should painstakingly be carried out, to prevent the formation of adhesions, or their reformation if they have been found and divided as the presumed source of irritative symptoms. If a large cerebral defect remains after the removal of a growth, or if the brain has receded from its normal level owing to evacuation of

Fig. 18. Showing method of closure of wound before removal of tourniquet.

cerebrospinal fluid, the space should be filled with warm isotonic salt solution before closing the dura.

The bone flap is solidly replaced and the scalp is, in turn, accurately approximated in a broad surface. It is well to draw together the galea aponeurotica by a few buried sutures before closing the outer layer. For the latter many use a continuous suture which has the advantage of speed. Inasmuch as the closure, in many cases, is completed before the tourniquet is removed, I feel the need of a more accurate and solid approximation; this is accomplished by rapidly placing about the incision a series of straight, round-pointed cambric needles which serve to keep the edges everted as each suture is tied, and thus to assure a ridge of tissue with a flat apposition, which prevents subsequent bleeding from the vessels of the scalp (Figs. 18 and 19). An approximation of the divided epithelial edges which is beyond reproach may be secured in this way.

Drainage is occasionaly advisable — perhaps in 20 per cent. of the cases — but it should be avoided if possible. It may be necessitated by constant oozing from the exposed parasinoidal sinuses; otherwise an extradural clot may form. Marion drains directly through the centre of the flap, in which a new opening must be drilled for the purpose. I prefer to take advantage of the trephine openings made in this method of resection at the upper angles of the flap. The drains, of cigarette form, covered with protective so that they may be easily withdrawn, are led out, not through the original incision, but through puncture wounds made in the scalp about 2 cm. to its outer side; this insures for the drain an oblique passage which can be occluded by pressure, in case there should be a tendency for cerebrospinal fluid to escape after their withdrawal. Kocher has devised small silver tubes for drainage in similar fashion, and they serve the purpose admirably.

The wound, covered with silver foil, is partly dressed and some pressure exerted before the

Fig. 19. Detail of method of closure. (Slightly magnified). Note ridge of tissue made by fine ligatures, which, when tied and locked to the side, should control all bleeding from scalp.

Fig. 20. Brain cyst, natural size, removed from patient shown in Figs. 21 and 22. Cyst wall not entirely degenerated. Area at upper third of figure seemed to be about ½ cm. in thickness and showed sarcomatous tissue.

tourniquet is removed, after which an abundant dressing with an outer starched bandage is applied. The ears should be carefully protected with cotton to prevent discomfort from pressure.

The first dressing is made in forty-eight hours, when the drains, if used, and all the sutures are removed. The silver foil and its thin inter-leaved paper, wet with alcohol, dries into a crisp protection which is particularly ideal for a head dressing.

The method of temporary cranial resection was devised to obviate a subsequent defect in the scull, and though I do not believe that even large cranial defects are necessarily harmful, they are certainly undesirable if a satisfactory exploration is possible without leaving them. For, on the one hand, should there be no increase or only a temporary increase of cerebral tension, an unsightly depression may be left in correspondence with the defect; whereas, on the other hand, if there is a permanent increase of tension, as in cases of tumor or obstructive hydrocephalus, there will be an unsightly protrusion.

It is in these cases of increased tension, particularly those due to tumor, that operative judgment is put to its greatest test. The accessibility and removability of a cerebral

Fig. 21. Fig. 22.

Figs. 21–22. Patient two weeks after operation for removal of large degenerated (cystic) subcortical sarcoma (of Fig. 20). Bone removed in this case through misjudgment, leaving large area of flattening, shown in figure to the right.

tumor can rarely be determined before the hemisphere is exposed. In the average case what course therefore shall we pursue? It is Horsley's custom, I believe, in consideration of the desperate nature of most of these cases and the trying detail of making a bone flap, to quickly break out and permanently remove the bone from a large area over the supposed site of the growth at his first stage operation, opening of the dura being reserved for a second sitting. If at this second-stage performance, with an opened dura, a growth should not be disclosed or should be disclosed and found to be inoperable, it would usually be impossible, even if desirable under these circumstances, to resuture the dura; impossible also, in many cases, even to close the scalp again unless the bone has been removed. The tension indeed may become so great, from subsequent hæmorrhage or œdema, as to force open even a carefully united scalp and lead to a fungus; even should this not occur a large hernia may develop. If on the other hand a tumor should be found and prove to be removable, a preserved bone flap might have been replaced.

I have recently been misled into a needless removal of the bone in a patient whose case, owing to the extreme tension, I deemed hopeless at a first-stage operation; for at the second sitting, with an open dura and the brain dropped back by lumbar puncture, a large cystic tumor (Fig. 20) was successfully extirpated, and I would have been glad not to have the patient leave the hospital with this huge defect (Figs. 21-22). It may be said, in passing, that I have never seen a bone flap lose its vitality, and indeed in one case reported with Dr. Thomas the flap was for one reason or another elevated on six occasions and a tumor finally removed at the last sitting.

My own experience does not accord with Frazier's, in that removal of bone alone, without opening the dura, will suffice for decompressive purposes in cases of tumor, and believing that a dural opening is always necessary I have come to make this opening in a situation where the protrusion will be protected — under the temporal muscle in cerebral, and under the occipital muscle in suspected cerebellar lesions.

It is oftentimes hard to decide upon the best course of procedure in individual cases, and I have tried in various ways to circumvent the difficulties which may arise. In some patients a primary decompressive operation has been made under the temporal muscle — preferably upon the same side as the lesion — and the more serious exploratory operation deferred for a subsequent sitting. Indeed, in lesions of obscure situation, this is always desirable, but I refer more particularly to those which have produced more or less definitely localizing symptoms. In a number of cases I have carried out a combined osteoplastic and decompressive operation which I was first forced into in a patient operated upon in 1903.

In this patient a large bone flap had been turned down to expose the right motor strip, owing to a contralateral hemiplegia. A huge infiltrating glioma was exposed, unquestionably inoperable. Though the dural opening was large, the hemisphere and growth bulged markedly, the protrusion doubtless leading to hæmorrhage into the vascular tumor owing to rupture of its poorly supported intrinsic vessels. It was impossible, under the existing circumstances, to resuture the dura or replace the flap.

Consequently, at the base of the flap the thin portion of the bone was rongeured away, not only on the flap side, but also well down to the base of the skull opposite to it — in other words, most of the bone, as in the usual subtemporal decompressive operations, was removed from under the temporal muscle. The dura was then freely opened in this low situation, and this allowed, by outward dislocation of the brain there, its partial reposition at the upper edge of the original dural opening, which could then be closed.

In this way a marked protrusion, possibly a breaking down and fungus, was prevented and an operative calamity averted. The experience taught two things which have been helpful to me since: I. *The principle*

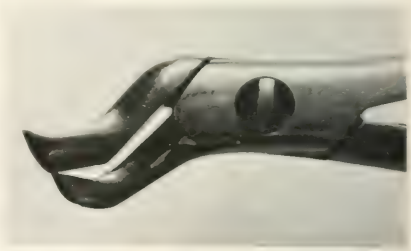

Fig. 23. Jaws of cutting forceps for excision of the cranium in the new born.

Fig. 24. Photograph taken four days after ganglion operation, to indicate situation of scalp incision in temporal region. As shown, incision should be practically invisible. Its angles are indicated by crosses.

of dislocation which is permitted by a large cranial and dural opening; and II. *The danger of decompression directly over a vascular growth.* The latter, I think, is not fully appreciated, for surgeons who have written on the subject advocate decompression, if possible, directly over a tumor — a proceeding which may promise to be more immediately efficacious in relieving tension, but which often leads to a large hernia if scalp alone covers the growth, and which may be the occasion of hæmorrhage as it was in this patient.

It is not always necessary to leave a beveled flap; indeed, it is not always possible. For example, in the thin skulls of infants, more especially in the new-born, it is not practicable, owing to the thinness of the bone; hence in these patients the flap is usually made throughout by a biting tool (Fig. 23), modeled on the Montenovesi pattern, which makes without jar a clean incision 8 mm. long by 2 mm. in width. It is an instrument which can progress very rapidly in these thin skulls.

Fig. 25. Fig. 26.

Figs. 25–26. Photographs of patient ten days after decompressive operation for tumor. Note curvilinear incision, with slight protrusion; also that partial shaving of head is all that is necessary.

Fig. 27. Showing extreme degree of protrusion possible after subtemporal decompression. Case of obstructive hydrocephalus from subtentorial tumor; pressure symptoms consequently not entirely relieved.

In the yielding skull of the new-born, I formerly experienced difficulty in making, safely and easily, the primary opening through which the forceps could be introduced and the bone incision started. The usual scalp incision in these cases is made within and concentric with the edge of the parietal bone, and I have found the most convenient means of entry is to scrape back the epicranium at one point, to the serrated edge of the growing parietal, where the pliable bone can be turned back and the incision begun.

Including the four cases cited in my original report in 1905, I have had ten operations for intracranial hæmorrahge in the new-born, four of the patients remaining alive and well.

OPERATIONS WITH REMOVAL OF BONE

I have thus far in the main considered only those forms of craniotomy in which a flap has

Fig. 28. Fig. 29.

Figs. 28–29. Photographs taken three weeks after decompressive operation with curvilinear scalp incision, for pressure symptoms due to the œdema of nephritis. Note partial shaving of head, allowing patient to conceal shaved area by parting hair on opposite side.

been made and then replaced. There remains a large number of operations — craniectomies — in which it is either impossible or inadvisable to attempt an osteoplastic resection.

Subtemporal Operations. Many of these operations are characterized by the removal of more or less of the thin cranial wall underlying the temporal muscle, whether they are conducted for purposes of exploration, usually in traumatic cases; for purposes of decompression, in states of increased intracranial tension associated with tumor, hydrocephalus or œdema of one source or another; for the removal of growths or natural structures like the Gasserian ganglion, lying in the mid-cerebral fossa; or even for the still deeper exposure of the 3rd ventricle or the pituitary body. Not only is it difficult in this situation to make a satisfactory osteoplastic flap, but the precaution is unnecessary if proper use is made of the temporal muscle, fascia and galea in the closure.

In all of these operations, with a perfect technique and abundant experience in the proper disposition of gauze, towels and sheets, a small portion only of the head need be shaved (Figs. 25 and 28).

A tourniquet cannot be used in this low situation, but pressure of a finger on the temporal artery as it crosses the zygoma allows the vessels to be picked up in the scalp, after their division, without undue loss of blood. Otherwise, the preliminary preparation, the subsequent precautions in regard to securing a small, isolated and well protected field in which to work, the administration of the anæsthetic on the operating table, and other details, are the same as those which have been described under osteoplastic operations.

The steps of a subtemporal craniectomy, however, differ somewhat, particularly in the manner of approach through the temporal muscle, according to the nature of the case, whether (1) a ganglion operation, (2) a decompression for tumor, or (3) an exploration in cases of cranial trauma.

1. In the *Ganglion Operation* — Here the muscle fibres must be divided and scraped away from the bone well down to the base of the temporal fossa, in order, after making the small cranial opening, to give direct access to the base of the mid-cranial fossa without undue elevation of the temporal lobe. The operation is, of course, conducted outside of the dura, the subdural space being opened with escape of cerebrospinal fluid only when the sensory root is liberated and withdrawn from its pontine attachment.

At the present writing I have performed sixty-eight of these operations and have ceased to regard them as particularly difficult — no more difficult, indeed, than many of the extracranial procedures which are advocated and which give no certainty of permanent relief in cases of major neuralgia. Two of my early patients I lost through inexperience; in the last forty operations there have been no complications of any sort.

The small curvilinear skin incision (Fig. 24), entirely within the hair margin, should be placed so as to avoid division of the upper branch of the facial nerve which innervates the occipito-frontalis muscle (pars frontalis). The muscle itself should be divided as in the older operation in horseshoe-shaped fashion, and scraped away from the bone so as to bare the lower part of the fossa. I still think it is essential for more reasons than one to remove the zygomatic arch, and this can be done by crowding forward the periosteum and fascia

from the point at the temporal attachment of the zygoma where it is crossed by the incision, without risk of injuring the aforementioned twig of the N. facialis.

If the soft parts are painstakingly closed in layers — muscle, fascia, galea and skin — there will be no apparent sinking in of the temporal region in consequence of atrophy of the muscle. A drain is rarely needed. Without tests for sensation it should be impossible to tell subsequently, by inspection alone, upon which side the neurectomy has been performed. Experience first, patience second, and a proper kit of spatulæ and blunt dissectors third, are in descending sequence the essential requisites for success in carrying out this delicate operation.

2. *The Subtemporal Decompression for Symptoms of Increased Intracranial Tension.* Here I think it is wise to make a curvilinear skin incision, more or less concentric with the temporal ridge or line of attachment of the temporal muscle (Figs. 25-26). A flap of scalp alone should be reflected with careful preservation of the stout galea-aponeurotica, which in turn should be incised and reflected laying bare the temporal fascia. This fascia is then incised in line with its fibres in about the middle of the muscle. While the edges of the split muscle are carefully held apart, its attachments, together with the pericranium, are separated by an elevator from the bone under the entire muscle belly.

The bone is then entered in any way desired — I prefer a Doyen perforator and burr, followed by Montenovesi forceps, and then by Horsley rongeurs as the opening is enlarged. The chief difficulties lie in the fact that the muscle cannot be elevated far from the skull without tearing it — an undesirable accident in view of the subsequent closure. Hence it is necessary to have a special form of retractor, as well as flat-bladed rongeurs which can be introduced far under the muscle and which will bite away the thin plates of bone without jar. Care must be taken not to injure the meningeal artery, not to tear the tense dura by a sharp spicule of bone, and above all to avoid cerebral contusion by rough manipulations with the rongeur forceps.

A generous area of bone having been removed, it remains to slit the dura in stellate fashion to the edge of the opening. In cases of great tension this is often a difficult thing to accomplish without injuring the pia-arachnoid — an accident which may lead to very undesirable consequences. One can usually estimate the degree of tension by palpation, but if this is not conclusive a very small entering incision is made. If the brain tends to forcibly protrude, especially if it is dry and there is no escape of fluid with resultant lowering of tension, a lumbar puncture should be performed in order to accomplish this end.

A dangerous, at times fatal, procedure, as I have often reiterated, when the cranium remains closed and cerebral tension is great, lumbar puncture and withdrawal of the cerebrospinal fluid from below loses its hazardous features after the cranium has been opened. In these cases it is often of the greatest aid, for the tension usually recedes sufficiently to allow the free opening of the dura without risk of injury to the leptomeninges and cortex. In more than half of my subtemporal decompression cases for tumor — now nearly sixty in number — lumbar puncture has been resorted to at this stage of the operation.

In this operation, again, the wound is painstakingly closed in four layers — muscle, fascia, galea and skin. There results more or less protrusion under the closed muscle, though never a large hernia such as one sees in cases of decompression protected by scalp alone. Even in the presence of a particularly tense cerebrum there is little risk of the wound reopening in consequence of pressure if there has been a secure closure with careful approximation of muscle and fascia. Though such an accident has never happened, it is to lessen this risk that the curvilinear scalp incision is preferred in these cases to the oblique incision used in the traumatic cases.

In the long run, for all cases of inoperable or inaccessible cerebral tumors, this, in my experience, has proved to be the most satisfactory method of decompression, as shown not only by the lessening of discomforts but by the most delicate of tests, the condition of the eye-grounds — a matter that will be considered fully by Dr. Bordley and myself at some future time.

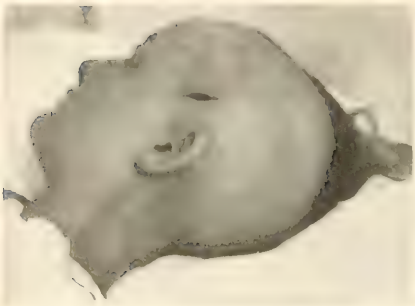

Fig. 30. Case of fracture of the base at time of first dressing. Cross hatching of sutures which have just been removed is apparent. Note situation of drain, which has been withdrawn from lower angle of incision where edges are gaping.

There is one group of cases which are an exception and which do not receive much benefit from temporal decompression alone — namely, those in which the condition is complicated by a hydrops ventriculorum due most often to closure of the iter by the pressure of a subtentorial growth (Fig. 27). I am comforted, however, by the belief that a way has been found of meeting the difficulties of such an obstructive hydrocephalus, but I prefer to delay its description until further opportunities of putting it into practice have demonstrated its actual value. Thus, although a subtemporal decompression is not always effectual in relieving the symptoms of pressure, it may be said that there have been no fatalities in our rather large series of cases.

Not only for tumor, but for other conditions of tension, will a subtemporal decompression prove to be often a helpful, sometimes a life-saving, measure. Among these conditions may be mentioned thrombosis or embolism; for when there is a large area of cerebral softening, the lesion, in consequence of œdema, may lead to great swelling. I have decompressed five of these cases, three of the patients apparently near the terminal stage of compression: all of them have recovered.

Other states for which the operation is suitable are intracranial syphilis — for the cessation of headaches and vomiting enables a subsequent antileutic régime to be much more efficaciously carried out after the decompression — and many forms of œdema, more particularly in acute serous meningitis and in the œdema of nephritis. Of the latter I have had one remarkable case (Figs. 28-29) — a young woman, in a profound uræmic state, not benefited by numerous lumbar punctures, who regained consciousness after the operation and left the hospital better than she had been for many months, practically free from headaches and vomiting, and with an extraordinary improvement in, though not a complete subsidence of, her so-called "albuminuric retinitis."

3. *The Temporal Exploration in Traumatic Cases.* Particularly in bursting fractures of the skull with general pressure symptoms and no external indication of the character and situation of the cerebral lesion, no site for an exploration is so likely to disclose the seat of trouble as one in the temporal region, and no form of operation is so likely to meet the needs of the conditions usually found as the "split-muscle" operation with removal of bone.

As drainage is often indicated in these cases, I prefer to make the skin incision parallel to the line of muscle fibres (Fig. 30), there being less need here for a protecting flap of scalp since the pressure of the traumatic œdema is an acute process which subsides in the course of a few days. Otherwise the operative approach to the lesion is similar to that in the tumor cases.

The advantages of such an operation in these patients may be briefly summarized as follows: An opening in this situation will disclose the extradural clot of a ruptured meningeal, if this vessel or one of its branches as is so often the case has been injured by a meridional fissure; similarly, this is the most common situation for an isolated subdural clot to be found; again, in bursting injuries associated with cortical laceration, it is the tips of the temporal lobes which are most often affected; further, in the larger number of basilar fractures the fissures run into the middle cranial fossa, and hence free bleeding from the base may be most effectively drained by placing a protective wick under the temporal lobe and leading it out at the lower angle of the split-muscle incision; lastly, since a post-traumatic

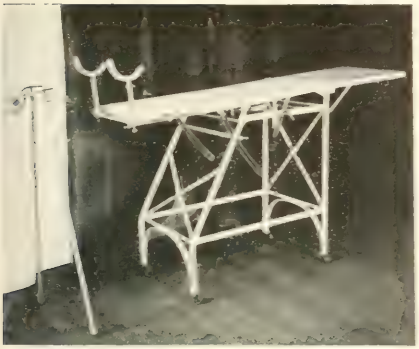

Fig. 31. Showing table with outrigger shoulder supports and unattached crutch for head; for use in suboccipital and high spinal operations.

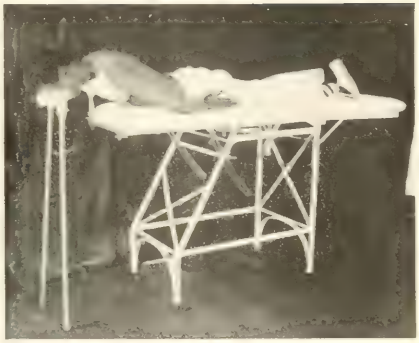

Fig. 32. Showing patient in position on table for cerebellar or high spinal operations.

period of œdema, which endures for some days after the injury (the wet brain of our predecessors) and which through pressure may prove serious in an unopened skull, is usual in these cases, the subtemporal opening serves to ward off almost completely the disturbances which otherwise appear. The operation itself is simple and it is often desirable to carry it out bilaterally.

Suboccipital Operations. For the exposure of subtentorial lesions — tumors of the cerebellum or lateral recess, a basilar meningitis to be drained, the freeing of adhesions about the 4th ventricle resultant to an old inflammation, etc.— the principles of tourniquet and bone-flap are inapplicable, just as in operations conducted through the temporal region. In this situation, also, owing to the possibility of subsequent firm closure under muscle there is little reason for preservation of bone.

Though many surgeons place the patient on the side for these operations, I much prefer a symmetrical face-down position particularly since I regard a bilateral exposure as desirable in all cases. A face-down posture, however, interferes greatly with respiration unless the shoulders are held away from the table to allow of free costal movements; consequently a table outrigger has been devised for these cases, possessing shoulder supports and a separate crutch with a horseshoe-shaped top in which the head comfortably and securely rests (Figs. 31-32). It gives a remarkably solid base for operative work, and the head may be raised or lowered, flexed or extended, by changing the position of the crutch. The anæsthetic is sprayed against a mask attached under the "horseshoe." This outrigger has been used for the past three years in all suboccipital work with the greatest satisfaction.

In order to fully benefit from the "principle of dislocation" mentioned under osteoplastic operations, a bilateral exposure of both cerebellar lobes is desirable to allow of the outward dislocation of the lobe on the opposite side during the manipulations of the other. This will permit of sufficient displacement to freely expose a cerebello-pontine tumor, for example, without the necessity of excising cerebellar tissue or, indeed, of injuring it in any way. For this symmetrical approach I find it advantageous to make, in addition to the usual curvilinear cut over the occipital ridge, a median incision with division of the soft parts not only down to the occiput but to the spinous processes of the upper cervical vertebræ. This "cross-bow incision" gives an exceptional view, owing to the possibility of lateral reflection of the flaps. A fringe of muscle and aponeurosis, together with the galea, is carefully preserved at the upper edge for subsequent union by suture with the reflected muscle flaps.

Primary openings having been made in the bone thus laid bare, they are enlarged with rongeurs, upward so as to expose the lateral sinuses on each side, across the median line avoiding the bone over the torcular, and then downward so as to include the posterior half of the foramen magnum. The dura is then widely opened and the mid-occipital sinus, if present, is ligated.

Owing to the possibility of cerebellar dislocation a wide area of exposure, either of the 4th ventricle or of the structures in the cerebello-pontine angle, is obtained through this large defect; and it is desirable furthermore not only for exploration but for purposes of decompression when subtentorial tumors prove to be irremovable. There are certain points in the bone where hæmorrhage may be met with in these operations, and especial care must be taken at the torcular and at the posterior margin of the mastoid processes. During the deeper manipulations, a large vein which bridges the subdural space at the side of the cerebellum is often encountered, and injury to it should be avoided if possible.

As foretold in my opening paragraphs, it has been my endeavor merely to picture some of the technical steps in these, the commoner cranial operations, in the hope that some operators, who may have had less opportunity for neurological work and whose interests nevertheless lie in this direction, may profit by some of my experiences. There are many of the more difficult procedures, as the operations on the pituitary body, drainage of the 3rd ventricle, extirpation of the Gasserian ganglion, removal of deep-seated tumors, operations for apoplexy and the like — the more dangerous and critical of the modern cranial operations — which for the time being and until their veriest detail is established on an unquestioned basis should rest in the hands alone of those specially trained, not only in neurology, but in the particular conduct of cerebral operations. The advance of operative neurology is greatly impeded by the prevailing impression in regard to its dangers and general futility — an impression due in large measure to the often reckless attempts made in this difficult branch of surgery by the untrained and inexpert.

FIBROMYOMATA UTERI

A Study of the Degenerations, Complications, and Associate Conditions in Three Thousand Five Hundred and Sixty-one Cases

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THE traditional teaching that fibromyomata uteri are innocent tumors, that they seldom produce symptoms, that after the menopause they become smaller or even disappear, and that in rare instances only do they cause death has been discredited. The fallacies of such a teaching have been proven by a systematic pathological study of the changes and degenerations which take place within the tumor or uterus, by a consideration of the complications and associate conditions, and also by the constitutional changes which take place in conjunction with these tumors.

The men who have worked on this subject have been so energetic in their efforts to disprove the traditional teaching, that they have gone to the other extreme and advocate that all fibromyomata uteri should be removed when diagnosed. Although many valuable papers have appeared during recent years in which the radical view has been advocated, the majority of surgeons doubt the correctness of such a policy, and make the criticism that the dangers of these tumors have been overestimated, because many independent conditions have been classified as complications.

In this paper I shall endeavor to present the subject in a fair and impartial manner and shall draw such conclusions as the statistics seem

to warrant. The larger the number of cases studied, the more valuable are the statistics and the more likely to be correct are the conclusions drawn. For this paper I have analyzed a series of 3,561 consecutive cases which have been reported by the following authors:

Martin	205	Lauwers	200
Noble	337	Eastman	117
Cullingworth	100	Webster	210
Frederick	125	Martin, F. H.	200
Scharleib	100	Cazenare	144
Watt-Keen	300	Giles	150
Hunner	100	Sarwey	360
McDonald	280	Jacobs	633
Total			3,561

The degenerations and changes in the tumor and uterus in 3,561 cases are as follows:

Necrosis of tumor	197	4.9%
Myxomatous degeneration	160	4.0%
Hyaline degeneration	72	1.8%
Hyaline degeneration and calcareous infiltration	12	
Cystic degeneration	141	3.5%
Calcareous infiltration	128	3.4%
Carcinoma corporis uteri	68	1.7%
Carcinoma cervicis uteri	25	.7%
Sarcoma	54	1.5%
Chorioepithelioma	2	
Œdema of tumor	23	
Fatty degeneration	12	
Hemorrhagic degeneration	16	
Hemorrhage into tumor	2	
Twisted pedicle, pedunculated tumor	6	
Torsion of tumor	1	
Incarceration of tumor	5	
Intraligamentous development of tumor	172	4.8%
Subvesical development of tumor	2	
Adenomyoma	10	
Adenoma of corporeal mucosa	34	
Polypoid degeneration of the mucosa	6	
Total	1,147	

In this series of 3,561 cases of fibromyomata uteri, there were recorded 1,147 degenerations and changes in the tumor and uterus. The question arises, did the 1,147 degenerations take place in a definite number of specimens or does it mean that 1,147 patients possessed tumors which had undergone degeneration. The question cannot be answered because the authors did not state which was meant. From the large number of degenerations reported by some writers, I am inclined to believe that the 1,147 does not represent that many patients.

It is a well-known fact that a patient may possess a uterus and tumor which shows two or more varieties of degeneration. If each variety of degeneration be tabulated under a separate class, it will readily be seen that the number of patients suffering from degenerated tumors is decidedly less than we are led to believe. A knowledge of the manner in which the degenerations are tabulated is most important if an attempt be made to estimate, with any degree of accuracy, the mortality which would result in these cases if the patients were not subjected to operation. For example, a uterus might contain a necrotic fibroid and a carcinoma of the fundus and be associated with an ovarian cyst, a combination not unknown, any one of which would cause death if the patient were not relieved by surgical intervention.

Among the conditions which may be considered complications in this series of 3,561 cases, are the following:

Conditions arising from inflammation:

Adhesions to viscera	97
Adhesions to tumor	5
Adhesions to omentum	6
Adhesions to ovary	3
Adhesions to bladder	1
Adhesions, universal	4
Chronic pelvic peritonitis	7
Exudate	3
Total	126

Conditions arising from pressure of tumor:

Ascites	7
Dilated ureters	2
Hydronephrosis	3
Intestinal obstruction, chronic	7
Intestinal obstruction, acute	2
Total	21

Conditions arising from miscellaneous causes:

Hemorrhage into abdominal cavity	3
Dangerous uncontrollable hemorrhage	41
Total	44

AGE AT WHICH DEGENERATION TAKES PLACE

In a series of 506 cases (taken from the reports of the Kensington Hospital for Women from 1893 to 1906 inclusive, and from the papers of Cullingworth and Scharleib) in which the ages of the patients were given, the

degenerations took place, divided into decennial periods, as follows:

Myxomatous degeneration	
Under 30	0
30 to 40	6
40 to 50	4
Total	10

Calcareous infiltration	
Under 30	0
30 to 40	1
40 to 50	0
50 to 60	1
60 to 70	3
Total	5

Cystic degeneration	
Under 30	1
30 to 40	5
40 to 50	5
50 to 60	1
60 to 70	3
Total	15

Necrosis of tumor	
Under 30	2
30 to 40	8
40 to 50	11
50 to 60	4
60 to 70	2
Total	27

Œdema of tumor	
Under 30	2
30 to 40	10
40 to 50	11
50 to 60	5
Total	28

Hyaline degeneration	
Under 30	0
30 to 40	0
40 to 50	3
50 to 60	1
Total	4

Carcinoma cervicis uteri	
Under 30	0
30 to 40	1
40 to 50	2
50 to 60	1
Total	4

Sarcoma	
Under 30	0
30 to 40	1
40 to 50	3
50 to 60	0
60 to 70	2
Total	6

Carcinoma corporis uteri	
Under 30	0
30 to 40	0
40 to 50	0
50 to 60	1
60 to 70	1
Total	2

Hyaline degeneration and necrosis	50 to 60	1
Hyaline degeneration and œdema	40 to 50	1
Myxomatous degeneration and calcareous infiltration	40 to 50	1
Calcareous infiltration and necrosis	30 to 40	1
Fatty degeneration	40 to 50	1
Inflammation	30 to 40	1
Carcinoma	60 to 70	1
Necrotic carcinoma	40 to 50	1
Malignant change	40 to 50	1
Adenocarcinomatous degeneration	30 to 40	1
Epithelial degeneration	60 to 70	1
Necrotic or sarcomatous degeneration	50 to 60	1
Calcareous infiltration, necrosis, adenocarcinoma of fundus	50 to 60	1

The age at which the degeneration took place in this series of 506 cases varied from twenty-three years to sixty-eight years. Of 114 cases in which degeneration took place 74, or 64.9 per cent, occurred after the age of forty years. These findings are in accord with the teachings of Giles, who states, "Age does not materially influence the character of tumors (fibromyomata uteri), except in the matter of degenerative changes which are strikingly absent before the age of forty years."

DEGENERATIONS

Necrosis was recorded in 197, or 4.9 per cent, of the cases, being the most frequent degeneration noted and also one of the most dangerous as regards the life of the patient. Necrosis is most likely to take place in submucous, subserous, pedunculated tumors, and also in tumors which have undergone calcareous infiltration. Myxomatous degeneration was noted in 4 per cent of the cases; cystic degeneration in 3.5 per cent of cases; calcareous infiltration in 3.4 per cent of cases. Intraligamentous development of the tumor was noted in 4.8 per cent of the cases. Although intraligamentous and subvesical development of the tumor are classified with the degenerations and changes in the tumor and uterus, they should more properly be considered as complications from the standpoint of the operation.

MALIGNANCY

Carcinoma corporis uteri was recorded in 63, or 1.7 per cent, of the cases. That there is an intimate relation between fibromyomata uteri and carcinoma corporis uteri is the belief of many surgeons. Sarcoma was noted in 54, or 1.5 per cent, of the cases. Carcinoma cervicis uteri was noted in 25, or .7 per cent, of the cases. When carcinoma cervicis uteri is found in conjunction with fibromyomata uteri it is probably a mere coincidence as there has been but little evidence offered and no proof produced that the condition is caused by the fibroid tumor. Although carcinoma cervicis uteri and chorioepithelioma are classified with the degenerations they should more properly be put with the associate conditions. Chorioepithelioma was found in two cases. In this series of 3,561 cases malignancy, including carcinoma cervicis uteri was recorded in 144, or 4 per cent, of the cases. Not including carcinoma cervicis uteri malignancy was found in 3.34 per cent of the cases. Lewis, in a study of 1,551 cases of fibromyomata uteri,

found that malignancy was present in 4.62 per cent of the cases.

In this series of 3,561 cases, the following conditions, due directly to the presence of the fibroid tumor, would probably have resulted fatally had the patients not been subjected to operation:

Necrosis of tumor	197	
Carcinoma corporis uteri	63	
Sarcoma	54	
Dangerous uncontrollable hemorrhage	41	
Twisted pedicle, pedunculated tumor	6	
Incarceration of tumor	5	
Torsion of tumor	1	
Intestinal obstruction, chronic	7	
Intestinal obstruction, acute	2	
Total	376	10.5%

Carcinoma cervicis uteri and chorioepithelioma are not included because they are considered associate conditions. There is no doubt but that a few cases of cystic and myxomatous degeneration would progress and probably increase the mortality 2 or 3 per cent, thus making the mortality without operation from 12 to 14 per cent.

The conservative surgeons recommend that fibromyomata uteri should be removed only when they produce symptoms. The surgeons who take the radical view, that all fibromyomata uteri should be removed when diagnosed, assert that women do not present themselves nor do they submit to vaginal examination unless they have symptoms and suffer. Therefore, of all patients who are known to possess fibromyomata uteri only about 12 to 14 per cent of those who have symptoms and suffer, would die from the degenerations and complications which result from these tumors if not relieved by surgical intervention.

Many of the associate conditions would produce death if the patients were not subjected to operation, but they should not be added to the estimated mortality of fibromyomata uteri, because they are independent lesions and in no way connected with the tumors except that the conditions coexist.

PHLEBITIS, THROMBOSIS, AND EMBOLISM

Phlebitis, thrombosis, and embolism are conditions which occur more frequently after operations for fibromyomata uteri than from any other surgical condition. The pathology of these conditions is not clearly understood, but it is probable that they are due to changes in the blood, changes in the blood vessels, and changes in the rate of the blood current.

Baldy in a series of 3,413 operative cases had nineteen patients die suddenly, thirteen of the deaths occurred in 366 cases of fibromyomata uteri. The deaths were diagnosed as follows: Cardiac 13, pulmonary 4, cerebral apoplexy 2.

Mallet had six sudden deaths in a series of 1,800 laparotomies; in 3 of the 6 cases the operation was performed for fibromyomata uteri. In 20 fatal cases of embolism in gynecological disease, collected by Kessler, 40 per cent were in patients suffering from myomas.

Fredericks, in a series of 125 cases of fibromyomata uteri, had eight post-operative deaths as follows: Cardiac embolism 2, pulmonary embolism or œdema 6. In a series of 463 operations for fibromyomata uteri, at the Tubingen Clinic, there were four deaths from pulmonary embolism.

Schenk reported 48 cases of phlebitis in 7,130 patients, operated upon at the gynecological clinic at the Johns Hopkins Hospital. Nineteen of the number occurred in cases of fibromyomata uteri. The number of operations for fibromyomata uteri was not stated.

CARDIO-VASCULAR CHANGES

During recent years more and more attention has been called to the cardio-vascular system, until now it is generally recognized that the changes take place in the heart and blood vessels in a large percentage of cases in conjunction with fibromyomata uteri. In 1884 Hofmeier called attention to cardiac disease in cases of abdominal tumors, and especially to fibromyomata uteri of large size. In 1888, Fenwick reported 22 deaths from cardiac degeneration, following operation for abdominal tumors.

Strassman and Lehman in 71 carefully recorded consecutive cases of uterine myomata, found that 40.9 per cent showed subjective symptoms and objective signs of organic heart lesions. In some cases the tumors were very small. Veit noted the frequency of asthmatic attacks in young women with relatively small

tumors and suggested that the attacks were suggestive of uterine myomata.

Webster in a series of 210 cases of fibromyomata uteri subjected to operation, found that cardio-vascular symptoms were present in about 25 per cent of the cases. Williams reported the findings in 22 autopsies in women with uterine myoma as follows: Valvular disease, mostly chronic, 6; fatty degeneration, 5; hypertrophy and dilatation, 3; atheroma of aorta, 3; small heart, 1; normal, 12. Wilson, in 10 autopsies of women dying from uterine myomata, found myocardial degeneration in 4 cases. He also reported that in 72 cases, in which radical surgical intervention was indicated, there were cardio-vascular disturbances in nearly 46 per cent of the cases. They were as follows: Adherent pericardium, 1; valvular disease, 6; myocardial affections, 14; murmurs (probably hemic), 12. Among 6 deaths in 427 operations for fibromyomata uteri Jacobs had the following: Cerebral hemorrhage, 1; cerebral anæmia, 1; embolism, 2. Boldt, in a series of 79 cases of fibromyomata uteri, found circulatory disturbances in 37, or nearly 47 per cent, of the cases. In this series of 3,561 cases, cardio-vascular changes were recorded only 32 times, which indicates that little attention was paid to this condition.

Baldy was probably correct when he made the statement that, "Fibroid disease of the uterus is not a local disease alone, but that the process is practically a general one in that it involves organs, how many and to what extent and how early we are unable to tell." The large number of cases in which fibromyomata uteri and visceral degenerations are associated, suggests that they may be caused by a common factor, and that by operation we can cure only the local condition and save the 12 or 14 per cent of patients who would die from the degenerations in and the complications caused by the tumors; diseased blood vessels and crippled organs cannot be restored by a myomectomy, a hysterectomy, or any other pelvic operation.

URINARY ORGANS

Many cases of fibromyomata uteri are accompanied by symptoms in the urinary organs. Probably the most usual condition is frequent micturition. In some cases there is inability to pass the urine, in other cases there is marked pressure upon the ureters, which results in hydronephrosis and degenerative changes in the kidneys.

In 210 cases of fibromyomata uteri reported by Webster, urinary disturbances were present in 30 per cent of the cases as follows: Deficient amount of urea, and the presence of albumin, casts, and oedema of the feet. Webster believes that the renal disturbances are produced by the same factors as those of the cardio-vascular system.

Knox collected 25 cases of ureteral compression from fibromyomata uteri and concludes from his studies that some compression is caused by large tumors in a large percentage of cases. Giles in a study of 150 cases of fibromyomata uteri observed symptoms of pressure upon the bladder or ureter in 25 per cent of the cases. The symptoms varied from frequent micturition to complete retention.

In this series dilated ureters and hydronephrosis were noted five times. Any other cases, of which no doubt many were present, were either not diagnosed or if diagnosed were not recorded.

COMPRESSION OF BOWEL

Large fibromyomata uteri which fill the pelvis produce more or less pressure upon the bowel and may even cause obstruction. In this series chronic obstruction was noted in five cases and acute obstruction in two cases. Partial obstruction with marked constipation, impaired gastro-intestinal function, distention of the bowel with gas, and malnutrition is probably present in many cases.

STERILITY

Women who possess fibromyomata uteri are prone to sterility. Mann, in an examination of 67 cases of fibromyomata uteri, found that 16 patients were unmarried, and 27 were married and sterile, making 43, or 64 per cent of cases, where there had been no pregnancy. Of 51 patients who were married 23, or 45 per cent, had been pregnant.

In a series of 125 cases of fibromyomata uteri reported by Fredericks, 66, or 52.8 per

cent, of the patients had not been pregnant. Of the 59 patients who had borne children there had been no pregnancy for at least ten or twenty years.

Giles, in a study of 150 cases of fibromyomata uteri, found that 60 per cent of the patients had never been pregnant. In 84 per cent of the cases the patients had either not been pregnant at all or had no pregnancy for at least 10 years. Of 94 patients who were married 69, or 65 per cent, had borne children.

It is probably safe to state that from 25 to 30 per cent of married women who possess fibromyomata uteri will not become pregnant.

ASSOCIATE CONDITIONS

The associate conditions in this series of 3,561 cases are as follows:

Conditions arising in the uterus:

Endometritis, senile	3
Endometritis, suppurating	5
Retroversio uteri	46
Procidentia uteri	38
Gestation	30
Total	122

Conditions arising in the ovaries:

Ovarian cyst, unilateral	244
Ovarian cyst, unilateral, intraligamentous	3
Ovarian cyst, bilateral	24
Ovarian cyst, bilateral, suppurating on one side	1
Ovarian cyst, bilateral, intraligamentous	1
Ovarian cyst, suppurating	8
Ovarian cyst with twisted pedicle	5
Ovarian cyst with intracystic hemorrhage	2
Ovarian cyst with intracystic hemorrhage, twisted pedicle	1
Ovarian cyst with hydrosalpinx	1
Dermoid cyst	23
Dermoid cyst, suppurating	4
Dermoid cyst with twisted pedicle	3
Dermoid cyst, bilateral; umbilical hernia	1
Dermoid cyst with multinodular cyst	1
Dermoid cyst with hydrosalpinx	1
Ovarian degeneration, cystic	287
Ovarian calcification	4
Ovarian fibroma	9
Ovarian fibrosarcoma	3
Ovarian carcinoma	10
Ovarian carcinoma, papillary, bilateral	1
Ovarian papilloma, unilateral	1
Ovarian papilloma, bilateral	1
Ovarian sarcoma	1
Ovarian hematoma	23
Ovarian abscess, unilateral	14
Ovarian abscess, bilateral	2
Oophoritis, chronic interstitial, unilateral	3
Oophoritis, chronic interstitial, bilateral	34
Parovarian cyst	23
Total	739

Conditions arising in the uterine ligaments:

Cyst of broad ligament	6
Haematoma of broad ligament	7
Abscess of broad ligament	2
Myoma of uterine ligaments	4
Total	19

Conditions arising in the Fallopian tubes:

Gestation, ectopic	9
Gestation, ectopic; salpingitis and hydrosalpinx	1
Haematosalpinx	31
Hydrosalpinx, unilateral	127
Hydrosalpinx, bilateral	19
Hydrosalpinx and tubo-ovarian abscess	1
Pyosalpinx, unilateral	73
Pyosalpinx, bilateral	46
Pyosalpinx with ovarian abscess	9
Pyosalpinx twisted upon itself	1
Pyosalpinx with tubo-ovarian abscess	2
Salpingitis, unilateral	138
Salpingitis, bilateral	48
Salpingitis and hydrosalpinx	3
Salpingitis and pyosalpinx	7
Salpingitis and tubo-ovarian abscess	3
Fibroma of Fallopian tube	2
Papilloma of Fallopian tube	1
Papilloma of appendages	1
Tubo-ovarian cyst	1
Tubo-ovarian abscess	5
Total	528

Conditions arising in the pelvis outside of the tumor, uterus, and appendages:

Carcinoma of the sigmoid	2
Recto-vaginal fistula	1
Thrombosis of veins of lower extremity	2
Varicose veins of the pelvis	9
Total	14

Conditions arising outside of the pelvis:

Appendicitis	69
Bartholinitis, chronic	1
Carcinoma of umbilicus	1
Cardiac degeneration	32
Extreme anæmia from hemorrhage	41
Hernia	7
Hernia, ventral	1
Hernia, umbilical	22
Hernia, inguinal	11
Hernia, crural	6
Laceration of the perineum, complete	1
Phthisis, pulmonalis	2
Cyst, vaginal	1
Peritonitis, tuberculous	7
Total	202

The associate conditions will not be considered in detail as they are independent lesions, and are not known to be etiological factors of fibromyomata uteri, nor are they themselves, except in a few cases, caused by the tumors; and no doubt in many instances where fibroid tumors have been removed the operation was primarily undertaken for an associate condition and the presence of the tumor not recognized until the time of the operation.

CHANGES IN CLASSIFICATION

In editing the reports, in order to simplify matters, the following changes were made:

Suppuration, necrosis in the centre of the tumor, and necrobiosis, are classified with cases of necrosis.

Epitheliomatous infiltration of a fibroid tumor arising from adenocarcinoma of the corpus uteri by metaplasia; and fibromyoma associated with carcinoma corporis uteri with epithelial degeneration, are classified with carcinoma corporis uteri.

Sarcoma of the fundus uteri is classified with sarcoma.

Malignant adenocystoma of the ovary is classified with carcinoma of the ovary. Ovarian cysts, large, are classified with ovarian cysts. Dermoid cyst, suppurating, with sinus through abdominal wall, is classified with dermoid cyst, suppurating. Abscess of the ovary is classified with ovarian abscess, unilateral. Cases of salpingo-ovaritis are classified as salpingitis. Chronic oophoritis is classified with oophoritis, chronic interstitial, bilateral.

All cases of ovarian cysts, pyosalpinx, hydrosalpinx, and salpingitis, in which mention was not made whether the condition was unilateral or bilateral, are classified as unilateral.[1]

Pregnancy, with dead foetus is classified as gestation. Procidentia of the uterus and vagina is classified with procidentia uteri.

Adhesions to serous surfaces, serous adhesions to soft parts, extensive intestinal adhesions, and adhesions, are classified with adhesions to viscera. Cases of general pelvic adhesions are classified as chronic pelvic peritonitis.

OPERATION

In regard to the choice of operation there is no doubt that myomectomy is the ideal operation. Unfortunately the operation is applicable in only a small percentage of cases — to easily accessible submucous tumors, and subserous tumors limited to two or three nodules, in young childless women, where complete eradication can be done. While myomectomy is the ideal operation for subserous tumors, it is, nevertheless, followed by a mortality of about 5 per cent. In the same class of cases there would be practically no mortality after a supravaginal hysterectomy. The mortality alone does not represent the seriousness of the operation as the morbidity is marked.

In cases of malignant degeneration of the tumor, or associate malignant disease of the uterus, a panhysterectomy should be performed.

A supravaginal hysterectomy is the operation of choice in all cases where a myomectomy is not indicated and in cases where a panhysterectomy is not demanded. A supravaginal hysterectomy is a more simple operation, requires less time for its performance, and is followed by a lower mortality than is the complete operation. The statement is frequently made that, in supravaginal hysterectomy the cervical stump may develop malignancy at a later date, and that the complete operation should be performed in all cases. Malignancy does develop in the cervical stump in a few cases after supravaginal hysterectomy, probably in less than 1 per cent of the cases. Jacobs had malignancy develop in the cervical stump three times in 466 cases of supravaginal hysterectomy. The criticism in favor of the complete operation is more than counterbalanced by a 3 per cent or 4 per cent lower mortality after the supravaginal operation.

Haultain collected a series of 1,781 cases of supravaginal hysterectomy, performed by good operators, in which the mortality was 5 per cent. He compared this with a series of 1,668 cases of panhysterectomy, performed by good operators, in which the mortality was 8.27 per cent, which shows conclusively that the mortality after the supravaginal hysterectomy is much less than after the complete operation.

The mortality following operations for fibromyomata uteri has steadily diminished as the refinement in technique has advanced. The mortality from recent reports is as follows:

		Deaths
Webster	210 operations with	5
Deaver	105 supravaginal hysterectomies with	3
Baldy	105 operations with	3
Haultain	203 supravaginal hysterectomies with	2
Noble	100 abdominal hysterectomies with	1
Werder	118 operations with	1
Jacobs	427 total and subtotal hysterectomies with	6
	1,268	21

A total of 1,268 operations with 21 deaths, a mortality of 1.6 per cent.

It is the custom, at the present time, of most surgeons when performing a hysterectomy to leave one or both ovaries, in the hope that the symptoms of the artificial menopause will be ameliorated. The benefit of this procedure is a disputed question which time only can settle.

MENOPAUSE

Until recent years it was the opinion of all members of the profession that uterine fibromyomata atrophied and disappeared, and that the patient made a spontaneous recovery after the menopause. Even at this time that same opinion is held by many members of the profession. That such a teaching is erroneous is evident from a study of these statistics. In a series of 506 cases degeneration was found 114 times, and in over 64.9 per cent of the 114 cases, the degeneration took place after the age of forty years, at or after the time of the menopause. In 3 cases, classified as carcinoma of the fundus uteri, all took place after the age of fifty years. Bland-Sutton claims that the dangers of fibromyomata uteri are increased after the menopause. He states, "There is nothing more ironical than a woman spending twenty or even thirty years of her life as a chronic invalid on account of a uterine fibroid, in the expectation that at the menopause she will be restored to health and begin a new life, and then to realize that far from this dream being fulfilled the fibroid becomes necrotic, extruded, and septic, and places her life in the greatest peril and that she may die in spite of surgical intervention."

CONCLUSIONS

1. That a large percentage of fibromyomata uteri undergo some form of degeneration, but that the majority, 64.9 per cent, of degenerations take place in women who are forty or more than forty years of age, or in other words, after the menopause.

2. That fibromyomata uteri and visceral degenerations are found associated in a large number of cases.

3. That young women who are anxious for maternity and possess small tumors which are causing no symptoms, need not be subjected to operation, but should be instructed to report for examination as soon as symptoms develop.

4. That all fibromyomata uteri which produce symptoms, regardless of the age of the patient, and all fibromyomata uteri in women forty or more than forty years of age, should be removed when diagnosed, because the mortality following operation, below 5 per cent, is less than the risk of carrying the tumor, as from 12 to 14 per cent of these patients would die if not subjected to operation.

5. That a supravaginal hysterectomy is the operation of election because of the ease and rapidity of its execution, and last, but not least, because it is followed by the lowest mortality and should be performed in all cases where a myomectomy is not indicated and where a panhysterectomy is not demanded.

6. That many of the associate conditions would cause death if the patients were not subjected to operation, but the mortality in these cases should not be added to the estimated mortality of fibromyomata uteri as they are independent lesions, and are in no way connected with the tumor except that the conditions coexist.

7. That a thorough pathological study should be made of all fibromyomata uteri which are removed, because of the malignant changes and the degenerations which take place in these tumors.

REFERENCES

Baldy, J. M. Amer. Jour. Obst., vol. lii, No. 3, p. 370, Sept., 1905.

Bland-Sutton. Lancet, London, p. 1,571, June 6, 1903.

Boldt, H. J. New York Med. Jour., vol. lxxxii, No. 2, p. 887, Oct. 28, 1905.

Cazenare, W. Revue De Gynécologie et De Chirurgie Abdominale, No. 4, pp. 609-623, Aug. 10, 1906.

Cullingworth, C. J. Jour. Obst. and Gynæc. British Empire, vol. i, pp. 3-21, Jan., 1902.

DEAVER, J. B. Amer. Jour. Obst., vol. lii, No. 6, pp. 858-874, Dec., 1905.
EASTMAN, T. B. Jour. Amer. Med. Assoc., vol. xlv, No. 2, pp. 1,238-1,242, Oct. 21, 1905.
FENWICK. Lancet, London, pp. 1,015 and 1,067, May 26 and June 2, 1888.
FREDERICK, C. C. Amer. Gynæc., vol. i, p. 255, 1902.
GILES, A. E. Lancet, London, vol. clxxii, No. 4,357, pp. 581 and 653, March 2 and March 9, 1907.
HAULTAIN, F. W. N. British Med. Jour., vol. ii, p. 233, Aug. 4, 1906.
HOFMEIER. Quoted by Kessler.
HUNNER, G. Amer. Medicine, vol. vi, No. 2, pp. 55-57, 1903.
JACOBS, C. Bulletin De La Société Belge, De Gynécologie Et D' Obstétrique, vol. xvi, no. 4, pp. 73-79, 1905-1906.
KESSLER. St. Petersburg Med. Woch., vol. xxx, p. 421, 1905. Abs. Amer. Jour. Med. Science, vol. cxxxii, No. 3, p. 473, Sept., 1906.
KNOX, J. H. Amer. Jour. Obst., vol. lii, pp. 348 and 496, Sept. and Oct., 1900.
LAUWERS, E. Bruxelles, Ch. Buleus, 1904. Zent. für Gyänkologie, No. 48, p. 1,503, Dec., 1904.
LEWIS, D. G. Amer. Jour. Obst., vol. lii, No. 4, pp. 481-495, Oct., 1905.
MARTIN, A. Cent. für Gynäkologie, No. 24, p. 389, 1905.
MARTIN, F. H. New York Med. Jour., vol. lxxxi, No. 24, pp. 1,217-1,221, June 17, 1905.
MALLET. Quoted by Baldy.
MANN, M. D. Amer. Jour. Obst., vol. lv, No. 6, p. 737, June, 1907.
MCDONALD, E. E. Jour. Amer. Med. Assoc., vol. xlii, No. 1, pp. 1,344-1,349, May 21, 1904.
NOBLE, C. P. Jour. Amer. Med. Assoc., vol. xlvii, pp. 1,881, 1,898 and 2,065, Dec. 8, 15, and 22, 1906.
SCHARLEIB, M. Jour. Obst. and Gynæc., British Empire, vol. ii, pp. 323-332, Oct., 1902.
SARWEY. Leipzig, 1907.
SCHENCK, A. New York Med. Jour., vol. lxxvi, p. 401, Sept. 6, 1902.
STRASSMAN AND LEHMAN. Quoted by Kessler.
VEIT. Quoted by Kessler.
WEBSTER, J. C. Amer. Medicine, vol. ix, pp. 401-404, March 11, 1905.
WATT-KEEN, JAMES. Inaug. Dissert., Wurzburg, 1902.
WERDER, X. O. Amer. Jour. Obst., vol. liv, No. 5, pp. 731-738, Nov., 1906.
WILLIAMS. Quoted by Webster.
WILSON. Quoted by Webster.

ACQUIRED ATRESIA OF THE COMMON DUCT DUE TO GALL-STONES[1]

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BY acquired atresia of the common duct is meant the condition which has developed in the individual after the functions of the liver have become adapted to extra-uterine requirements and been normal to all intents and purposes beyond the period for the onset of icterus neonatorum. It excludes congenital anomalies of development in the bile passages and the class of cases presenting at, or soon after birth, cirrhosis, cholangitis, and obliteration of the bile passages, more particularly the common duct. Of congenital obliteration of the bile passage due, presumably, to the action of a maternal toxic agent on the fœtal liver and bile passages, there are more than sixty cases recorded. Almost all are associated with cirrhosis. The cholangitis seems to be a descending process affecting eventually the extra hepatic bile passages and leading to their obliteration. That some cases of cirrhosis go to a fatal termination before the obliteration process has been started, or completed, seems established. Likewise, that in some the obliterative process is delayed or extremely slow in action seems true. In this connection Treves' case is difficult to classify, in that jaundice did not set in until two years of age. He operated the patient successfully by cholecystenterostomy at nineteen years of age for obliteration and absence of the lower end of the bile duct. On the other hand, as will appear in connection with other and more clearly defined cases of acquired atresia, the obliterative process may have been due to irritation of a gall-stone passed subsequently to the onset of jaundice and before operation.

Before the operative treatment of cholelithiasis became generally practiced and the

[1] Read before the Western Surgical and Gynecological Association at its Seventeenth Annual Meeting at St. Louis, Mo., Dec. 30 and 31, 1907.

large series of operated cases were collected, pathologists — Orth, Ziegler, and others — mentioned the condition of acquired atresia of the bile passages but, usually, scantily and with reference to its rarity. Surgical records bear out this view. Kehr (1) had operated on more than 400 cases of gall-stones before encountering an instance of complete obliteration of the choledochus. In his case there was complete obliteration of the common duct at the mouth of the cystic, caused by a stone and ulcer. The duodenal part of the common duct was converted into a pus-containing cyst. No bile was found in the hepatic duct above the stricture, due to long existing stasis and its consequent disturbance of the liver cells. Resection of the stricture of the common duct with drainage of the hepatic accomplished a cure. Robson (2) does not mention an instance of his own occurring in 539 operations, but refers to the case of Treves (3) mentioned above. Moynihan (4) mentions the possibility of the condition but refers to no personal experience with it. A somewhat careful but incomplete review of the literature has yielded other cases so few in number that a brief account of each may be of interest. In this connection the writer wishes to acknowledge indebtedness to Rolleston in his "Diseases of the Liver, Gall-Bladder and Bile Ducts" for several of the cases reported below and other matter in connection with the subject. Ashley's (5) case was that of a girl, 7 years of age, who had been jaundiced for two years and a half. The common duct was obliterated near the duodenum, but the proximal part, together with the cystic duct, formed an enormous cyst containing 16 pints of bile-stained mucus. In a period of three months she was tapped ten times and on each occasion 8 to 10 pints were removed. Post mortem, the cyst was found to consist of the cystic and common ducts, between the latter of which and the duodenum no communication was found.

Oxley's (6) case showed an obliteration of the duodenal termination of the common duct with the rest of the common duct dilated so as to form a cyst the size of a cocoanut. Rolleston (7) mentions a child of 9 years in whom syphilis was suspected but not proved. Here the cystic and hepatic ducts were dilated, and the common duct to the size of a fist. The gall-bladder was atrophied and collapsed. The opening of common duct into the duodenum could not be found. St. Bartholomew's Hospital Reports (vol. xxx, Surgical Registrar's Reports, p. 216) contain the history of a case illustrating cicatrization of an ulcer due to gall-stone. "A woman forty-six years of age was operated for recurrent attacks of biliary colic. The gall-bladder was empty and contracted, but the cystic duct was dilated by five calculi; which were removed. The cystic duct was united to the abdominal wound and bile discharged for ten days. The patient then got worse and died suddenly. At the autopsy the common bile duct was dilated and contained several calculi; its opening into the duodenum was completely obliterated by cicatrization of an ulcer."

Pye-Smith (8) records a case of stenosis of the common duct due to the stone-ulcer-cicatrix sequence. St. Thomas Hospital Reports (vol. xxx, p. 169) contain an example of a tight stricture of the common duct with a soft calculus just above it in a woman 26 years old. Simple stricture was found in a case reported by Holmes (9) and Moxon (10) at the beginning of the common hepatic duct, which, except for bilirubin calcium stones, would not be subject to gall-stone irritation. In a case reported by Moxon and Phillips' (11) cases there was no history of gall-stones. Rolleston (12) describes the only case of simple stricture of the common bile duct which has been detected at St. George's Hospital in the last 15 years. "A man aged 60 years, with chronic jaundice, was admitted with pneumonia which proved fatal. There was a fibrous stricture of the common bile duct in its lower fourth and great distention of the gall-bladder and bile ducts. There was no evidence of any malignant disease or of gall-stones." Krokiewricz (13) reported the case of a woman 57 years of age, in whom the lower end of common bile duct was much stenosed, as if from the stone-ulcer-cicatrix sequence, but upon microscopic examination the process was found to be carcinomatous. Cordier (14) reports the case of a man of 55 years of age with gall-stone history, established by the passage of a stone in stool and persistent

jaundice, in whom at operation a gall-bladder containing 4 pints of bile and mucus, but no stone, was found. There was a complete stricture of the common duct just behind the duodenum. Anastomosis between gall-bladder and jejunum resulted favorably. Another case (15) of the same writer is that of a man aged 21 years who began at 3 years to have colic and jaundice. The stools at time of operation were, however, slightly bile-stained. At operation an impermeable stricture of the lower end of the common duct was found. As in the previous case no stones were found, and an anastomosis between enlarged gall-bladder and jejunum gave a successful issue. The presence of bile in the stools, even though in small amount, shows that the process of cicatrization was not complete, hence strictly the case should not be included as one of atresia. The same writer (16) reported a case of obliterated common duct following trauma over the liver and without the presence of stone in a man of 55 years. Cholecystjejunostomy resulted favorably. The writer's case is as follows:

When seen July 10, 1904, J. B. C., female, married, age 66 years, nativity Mass., residence Dubuque, Iowa, gave this history in connection with her illness which has existed 2 years, 9 months.

Family history was negative. Previous history negative, except for severe headaches and occasional palpitation.

Present illness began Oct., 1901,— 2 years and 9 months ago — with sudden and severe pain in the abdomen in the region of the ninth and tenth ribs, vomiting, purging, chill, and fever. The attack lasted one to two days and subsequent prostration delayed patient's return home from Massachusetts two weeks. Three weeks after return home began to experience excruciating soreness in the same region as before, and extending around ribs to right shoulder blade and shoulder. This condition, with variation in severity, lasted all winter. April, 1903, patient experienced sensation of pushing and grinding, starting in the right side. This extended across back and abdomen and lasted two weeks. With this girdle pain patient was confined to bed and jaundice set in. This has persisted. From a weight of 116 pounds patient gradually lost 36 pounds, but the loss of strength was not as great in proportion as the loss in weight. With the jaundice there was loss of appetite, itching, dullness of the sensorium, many slight chills and, once, a severe attack with high fever. The stools which had been dark became clay-colored. Urine has been scanty and high-colored most of the time since jaundice set in, and patient has had to micturate as often as four times at night. April, 1904, feet began to swell slightly and later the body. The bowels, irregular and costive before, began to be irregular and loose, moving three to four times in 24 hours, and accompanied by pain in lower abdomen.

At present, patient suffers no longer with headaches, gets faint at times, has enjoyed fair appetite until last few days, is not troubled with belching or heartburn, has some shortness of breath, but no cough, occasional palpitation which, however, antedated the illness in question. Weight, 2 weeks ago, 86 pounds. Stools watery and cream-colored.

Examination revealed a short, jaundiced woman with spare body above the waist, and prominent abdomen, and slightly œdematous lower extremities; p. 90; temp. 99.2°; resp. 16; sclera bile tinged; lungs negative; heart apex beat third inter-space inside nipple and no murmurs; liver dullness extends from fifth rib in mammillary line to four fingers' breadth below costal margin; ascites present and prevents examination of other abdominal viscera, but no tumor made out nor tenderness, except near costal margin on a line between ninth rib and umbilicus; circumference of abdomen at umbilicus 86 cm.; urine, high-colored, acid, 1032, bile present, albumin slightest possible trace, sugar none; occasional hyaline cast, some small round epithelial cells probably from kidney, a few abnormal red blood corpuscles, abundance of various forms of large epithelial cells probably from bladder, and pus corpuscles. The next day six quarts ascitic fluid were removed, having a specific gravity of 1011 and a trace of albumin. The abdomen was now soft, and permitted satisfactory palpation. The liver was felt to be hard and smooth for three fingers' breadth below costal margin on the right, and to reach more than half way to the umbilicus, thence across epigastrium transversely, where the edge could be easily grasped between fingers and thumb of same hand. In the epigastrium slightly to the right of the median line below liver margin numerous hard nodular masses slightly tender and movable were made out. The liver itself was not tender, but the region of gall-bladder was still markedly so. Spleen was enlarged. Abdomen otherwise negative.

After carefully considering the hazards of operation in the presence of jaundice, and, more particularly, ascites, patient decided upon operation. Accordingly, through a vertical incision through the right rectus, the abdomen was opened. The residual ascitic fluid was removed. Viscera were found congested and in addition in upper right quadrant densely adherent. So far hemorrhage was not extraordinary, but upon separating adhesions the fresh surfaces bled freely and continuously in spite of ligatures and the fact that no demonstrable vessels were severed. A hard cirrhotic liver and several enlarged lymphatic glands were readily found, and a small contracted gall-bladder identified. From this stage on further

exploration had to be done almost entirely by palpation on account of hemorrhage. A movable stone, the size of an olive, was felt in the common duct, but no evidence of malignant growth was made out. By this time, the hemorrhage had become alarming, and so obscured the field that the attempt to incise the common duct to allow for bile drainage at least, or, in fact, to proceed further, had to be abandoned. The field was packed, and the abdominal wound partly closed. Patient left the table showing signs of shock and hemorrhage, and died fourteen hours later from complete exsanguination in spite of calcium chloride, etc.

Shortly after death a partial autopsy was performed. At this the abdominal cavity was found entirely free from clots, although the pelvis contained free blood. The findings at operation were confirmed. The gall-bladder was contracted to the size of an olive. The common and hepatic ducts were greatly enlarged. At the junction of cystic and common ducts was found a cicatricial contraction. In bladder and ducts were several small flat concretions. Upon removal of the large stone from the lower end of the common duct the condition of atresia of this duct was discovered. The lower end of the duct was perfectly smooth without a sign of opening into the duodenum and might be likened to the blind finger-end of a rubber glove. The bile tract, a portion of the liver, the duodenum, and pancreas were removed *en masse* and examined macroscopically, and microscopically. Macroscopically the liver presented the appearance of hypertrophic cirrhosis, but under the microscope the changes of atrophic cirrhosis were present. Macroscopic examination showed atresia of both common duct and that of Wirsung. The duct of Santorini could not be found, and there was entire absence of the papilla on the duodenal side. Microscopically, the ductus choledochus, that of Wirsung, the pancreas, and duodenum showed chronic inflammatory changes but no malignant elements. Bile was present in the common duct. The stone was found to be a mulberry calculus composed almost entirely of cholesterin, with the poles made up, superficially at least, of bile pigment and calcareous salts.

The cases cited serve to show the comparative infrequency of this condition, as well as the wide range of complications which may be encountered, except cirrhosis, which occurred in the writer's case. Atresia due to carcinoma of the papilla of Vater and head of the pancreas is to be expected, likewise, atresia due to extra dural pressure from any cause, i. e., tumors,— inflammatory or neoplastic, — and rarely adhesions.

By common consent the etiology of the condition is regarded to be infection usually associated with gall-stones, although the stone has not always been found. In such cases the stone is presumed to have been present and started the ulcerative process and been passed before the stricture became complete. Some have likened the process to that of obliterative appendicitis and urethral stricture. The pathological interpretation of the condition rests upon the formation of an ulcer due to infection alone, or infection plus mechanical damage due to the irritation of a stone, leading to new connective tissue formation and subsequent cicatricial contraction. In some of the cases cirrhosis was present in the liver. In this class of cases some question has arisen in regard to the sequence of events. It has been difficult to establish the priority of the bile passage process in most instances, but in some of the so-called congenital cases this was determined in the affirmative. Further observation, too, seems to prove that congenital anomalies of the bile passages are less often predisposing factors than formerly thought to be the case.

The diagnosis of atresia of the common duct cannot be made exactly before operation. In the presence of long-continued and persistent jaundice and bileless stools with a clear gall-stone history and without demonstrable tumor or gall-bladder, one might suspect the condition on the basis of Courvoisier's law. Among the cases cited, however, there are several with enlarged gall-bladders associated with a history of gall-stones if not actually with the stones. Cirrhosis being an infrequent complication of obstruction of the common duct, in fact, of the acquired cases so called the writer's is the only one I have encountered, although common among the congenital cases so called, would be no aid. These facts taken together with the

absolute infrequency of acquired atresia would make the diagnosis a mere guess.

The procedures for the relief and cure of atresia have already been suggested in connection with the summary of reported cases, i. e., resection and various anastomoses of gall-bladder or ducts to the intestinal tract. It is conceivable in the case of an atresia low down at the papillary orifice Kocher's operation of trans-duodenal choledochotomy might do very well, sewing the mucous membrane of duct and duodenum together on either side of the incision. In the presence of cholemia and, especially, hemorrhage, a primary incision of the common duct for drainage and recovery from the cholemic state with secondary resection or anastomosis would be valuable in desperate cases. In general, atresia being a late stage in the natural history of cholangitis with or without cholelithiasis, Richardson's rule of operating for gall-stones as soon as they begin to offend has the value of prophylaxis in this class of cases.

REFERENCES.

1. Kehr, H. Introduction to the Differential Diagnosis of the Separate Forms of Gall-Stone Disease, 1901 (translation), p. 48.
2. Robson, A. W. Mayo. Diseases of Gall Bladder and Bile Ducts, 1904.
3. Treves, F. The Practitioner, Jan., 1899, p. 18.
4. Moynihan, B. G. A. Gall-Stones and Their Surgical Treatment, 1905.
5. Ashley. Medical Chronicle, Oct., 1898, p. 28.
6. Oxley. Lancet, 1883, vol. ii, p. 988.
7. Rolleston, H. D. Diseases of the Liver, Gall-Bladder and Bile Ducts, 1905, p. 652.
8. Pye-Smith, P. H. Trans. Path. Soc., xxiv, p. 295.
9. Holmes. Trans. Path. Soc., vol. ix, p. 130.
10. Moxon, idem, vol. xxiv, p. 129.
11. Phillips. Trans. Clinic. Soc., vol. xxi, p. 26.
12. Rolleston, H. D. Diseases of the Liver, Gall-Bladder, and Bile Ducts, 1905, p. 654.
13. Krokiewicz. Wien, Klin. Woch., March 31, 1898, S. 321.
14. Cordier, A. H. Surg. Gyn. & Obstet., vol. ii, p. 381-382.
15. Idem.
16. Idem.

HEMATURIA IN PREGNANCY[1]

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THE older literature of medicine contains many references to "idiopathic" or "essential" hematuria. Under this head were classed cases of renal hematuria for which no adequate cause could be assigned. As the kidney became more and more the subject of surgical intervention and critical pathologic study, it was found that, in nearly every instance, although the affected kidney might appear macroscopically normal, there were microscopic changes sufficient to account for the hematuria.

Before accepting the possibility of "hemorrhage from a healthy kidney," a position maintained by Klemperer and others, it must be shown, first, that the hemorrhage is really from the kidney, and second, that there is no possibility of any change, however minute, in the kidney structure.

The first requirement is easy to satisfy, but in order to be able to answer the second in the affirmative it will be seen that every part of the kidney must be subjected to the most searching scrutiny by good pathologists.

Applying these tests to the reported cases there are but two (Schede and Klemperer) that fufill them. In each of these cases the hemorrhage ceased after the removal of the kidney, and a painstaking examination of the removed organ showed no departure from the normal. Even here one cannot escape the suspicion that the underlying lesion was overlooked, as in the case of Nicholich (1), in which nephrectomy was performed for continuous unilateral hematuria of four months standing. To the naked eye the kidney appeared normal, and the examination of a section by a reputable pathologist of Vienna showed noth-

[1] Read at the meeting of the Southern Surgical and Gynecological Association, December 13, 1905.

ing abnormal. Some time later a further examination of several sections was made by Motz and Albarran, who found well-marked lesions of chronic nephritis.

To account for the hematuria in these cases, where no adequate cause appears, two principal theories have been advanced, which may be called, for convenience, the angioneurotic and the chronic nephritis theories.

The first, championed by Klemperer and others, ascribes the bleeding to vasomotor changes, affecting the renal vessels. Advocates of the second theory maintain that in nearly every case of obscure renal hematuria the bleeding is due to the changes in the kidney incident to chronic nephritis. Those holding this view insist that hematuria may be the first sign of chronic nephritis, and that it may antedate by many years the appearance in the urine of albumin and casts.

A study of the more recent literature of this subject shows that the latter theory is steadily gaining ground. It has for its supporters most of the surgeons and the ablest pathologists. Its advocates consider that the nephritis may be diffused or circumscribed, and that, in the latter case, its detection may be extremely difficult.

This is well shown in one of Albarran's cases, where the kidney was exposed and found enlarged and congested. At first nothing abnormal was found, but on a more careful search, a minute grayish nodule was seen at the base of one of the pyramids. This was removed, and found, upon examination, to show the lesions of chronic nephritis.

Rovsing (2) in a critical examination of this subject calls attention to the part played in these cases by movable kidney, and cites four cases of his own to sustain his contention. He calls attention to the fact that in several of the published cases, described as "renal hemophilia," the kidney was misplaced. He ascribes the bleeding to stasis, brought about by tight lacing or twisting of the pedicle.

Cabot (3) also reports an interesting case of severe hematuria, due to movable kidney. This patient was placed in bed with her shoulders lowered and her hips raised. At the end of forty-eight hours there was a marked decrease in amount of blood in the urine and in a short time it disappeared entirely. A few days later the patient was allowed to lie flat for four hours; on the next day blood reappeared in the urine. The original position of the patient was resumed, and she was kept in it for several weeks, after which she was allowed to sit bolstered up in bed for twenty minutes each day. This was immediately followed by the appearance of blood in the urine. The kidney was then exposed and, except for a thickened capsule, appeared normal. It was fixed to the transversalis fascia. This was followed by complete relief from the hematuria and all other symptoms.

Cabot discredits the theory of twisted pedicle as a cause of the congestion, and states that, in his opinion, it is a very rare condition. He believes the cause of the congestion to be a slipping downward of the entire organ, which causes an obstruction of the thin-walled vein, while the thicker and more resistant artery escapes.

The explicable causes of renal hematuria are numerous. Fowler (4) in his able monograph upon which I have drawn freely, and to which I cheerfully acknowledge my indebtedness, divides them into local and constitutional. Among the former are inflammation, embolism and thrombosis, traumatism, retention, abnormalities, parasites, tuberculosis and tumors. Among the latter are infectious diseases, nervous diseases, diseases of the blood, intoxications and poisons, and pregnancy and lactation.

A study of these causes shows that some disturbance of the circulation in the organ is the underlying cause in most of them, and that this disturbance is in the nature of stasis or congestion.

In the case I have to report, the rapidly recurring pregnancies were undoubtedly the cause. It is as follows:

Mrs. L. V. G., white, 31 years of age, came under my care in October, 1906. She was a native and lifelong resident of a malarious section of Virginia. Family history unimportant.

Personal History. Never very strong. Had enlarged cervical glands on left side when a child. Scar remains. Married at twenty. Has had seven children, six living and well, and one dead by accident. Two miscarriages. One year ago spat some blood, but does not know where it came from.

Present illness. First noticed blood in urine four years ago. This came on in February while she was

pregnant, and lasted ten days. Child was born in March. There was no hemorrhage during next pregnancy, but in December, 1905, while pregnant with her last child, the hematuria again appeared and has continued, without intermission, since, the child having been born in March, 1906. The hematuria has been more profuse at times than at others, but has never ceased entirely since December, 1905. No history of renal colic. During past year has suffered from heaviness and stiffness in left side, just under ribs and has been sore to touch in that locality. No malaria. Swelling of feet has existed pretty constantly since first pregnancy. It is worse when she is pregnant, but has never disappeared entirely.

Examination. Frail and anemic woman. Pulse weak and rapid. Lips and mucous membrane blanched. Lungs and heart normal. Marked soreness on palpation over the left kidney, but no enlargement detected.

Urine. S. G. normal. Albumin present (due to blood). Microscopically, abundant red blood cells. No pus. No casts seen after most diligent search.

Cystoscopy by Dr. H. A. Fowler. Bladder normal. Ureters normally situated. Openings normal. From left ureter bloody urine oozes with each contraction of trigone on that side. The jet is not thrown out with the usual force but oozes down over trigone. Fluid from right kidney normal. Catheter in right ureter passes two-thirds of the way to the kidney.

As this patient had been under the care of reputable physicians, who had exhausted all medical means for her relief, and as the continued loss of blood was evidently telling on her, a nephrectomy was advised and accepted.

Operation October 30, 1906. Kidney easily exposed and found to be small, with a pale, non-adherent capsule. Two patches of subcapsular hemorrhage. Dense adhesions about upper pole which had to be divided before the kidney could be removed.

Post operative history. Patient made a good recovery. Immediately after her return home she again became pregnant and again blood appeared in the urine. After the birth of the child, which was uneventful, the blood disappeared from the urine and has not reappeared since. She states that she feels well.

Summarizing, we have a history of rapid child bearing, with hematuria appearing during the fifth pregnancy and lasting ten days. It skipped the sixth pregnancy only to appear again during the seventh and never ceasing after that. Another pregnancy immediately followed the removal of the left kidney, accompanied by hematuria, presumably from the remaining kidney, which ceased when the child was born.

Pathologic report. The kidney was sent to the Army Medical Museum. The report of Capt. Russell shows thickening of the capsules of the glomeruli, with unduly prominent endothelium. The tufts are congested and show proliferation, with a few polynuclears present. The capsules contain an albuminous exudate, a few tissue cells, and an occasional red blood cell. In one section there is a small area in the cortex, just beneath the capsule, which shows several glomeruli which have undergone hyaline degeneration and become completely obliterated. At this point the capsule is adherent, dipping down into the cortex by a coarse band of connective tissue. There is marked infiltration of small round cells in this area. The picture here presented is that seen in small granular kidney.

The epithelium of the convoluted tubules shows a general albuminous degeneration. None of the cells shows a regular outline and the nuclei of many of them fail entirely to take the stain. There is very little desquamation. The lumina almost invariably contain detritus which is homogenous in appearance and stains brightly with eosin. In some cases the coagulum distends the tubules so that, practically, we have casts. In a cross section of one of the pyramids it will be noted that there are areas in which there is an interstitial proliferation, accompanied by a congestion of the capsules and the presence of an exudate which in appearance is homogenous.

The most marked changes observed in the sections as a whole are: (1.) Those confined to the glomeruli, which are characteristic of glomerulo-nephritis, and (2.) The peculiar patchy increase in the interstitial connective tissue, seen in the cross-section of the pyramids.

Remarks. There can be little doubt but that the renal changes in this case, leading up to the hematuria, began during the first pregnancy. In this connection, the history of oedema of the feet since then is significant. Owing to the rapidity with which one pregnancy followed another, the kidneys never had time to recover from the strain put upon them, until the conditions present culminated in a chronic congestion which produced the hematuria.

The appearance of the blood in the urine after the nephrectomy may be explained in two ways. It may be assumed that, with only one kidney to take care of the excretory products of pregnancy, and that kidney one that had not time to compensate for the loss of its fellow, the tax on it was too great, and a congestion resulted. Or this appearance of hemorrhage from the second kidney may be accepted as a proof of the statement of Casper, that, although the hematuria may be unilateral, the nephritis of which it is a symptom is always bilateral.

The case also shows the comparatively slight effect of a nephrectomy upon subsequent

pregnancy. It is the second instance in my experience where pregnancy has followed a nephrectomy, and in neither was there any noticeable effect from the removal of the kidney. In this case the pregnancy followed so closely upon the nephrectomy that any untoward results would surely have shown themselves. Baldwin (5) has noticed the same fact, and reports two cases of his own and three from the literature to show that the prognosis of pregnancy after a nephrectomy is by no means unfavorable.

Since it seems to be established that the hematuria of pregnancy is a symptom of chronic nephritis, it is pertinent to inquire as to the cause of the nephritis. The generally accepted opinion is that the renal changes in pregnancy depend upon perverted metabolism and consequent auto-intoxication. The perverted metabolism may be of maternal or fetal origin, or both.

It is only fair to state, however, that certain authorities ascribe a prominent part in the nephritis of pregnancy to dilatation of the ureters from compression. That this compression does exist in pregnancy has been demonstrated by Halbertasma and Leyden, and some authors make Cruveilhier the father of the statement that, during his services at the Maternity Hospital, all women that died during pregnancy or shortly after delivery, had dilated ureters. The condition, however, must be rare as compared with the number of cases showing renal changes. Bouman (6) analyzes seventeen cases of hematuria in pregnancy. The blood in all cases was from the kidney and disappeared after delivery, in several cases reappearing during a subsequent pregnancy. Commenting on the various theories as to the causation of the hematuria in these cases, he dismisses the idea of "essential hematuria" as unscientific and untenable; considers briefly the hemophilic and angioneurotic theories, and concludes that his analysis of seventeen cases shows that chronic nephritis is the underlying factor in nearly every one. In his opinion, there are renal changes in these cases before conception, and pregnancy aggravates these changes through congestion or auto-intoxication.

Gaucher and Sergent (7), in discussing the nephritis of pregnancy, consider that the condition depends upon auto-intoxication, and that it is intensified by each recurring pregnancy, until finally the condition becomes chronic and incurable. The post-mortem examination of kidneys in these cases shows either small and granular kidneys with cysts, or large, white kidneys without cysts or granulations. Histologically, islands of sclerosis are found.

Diagnosis. In the diagnosis of renal hematuria the cystoscope is invaluable. By its aid we can learn from which ureteral orifice the blood is escaping, and also make ourselves certain as to the presence of a second kidney. Supplementing the cystoscope by the ureteral catheter, we can determine that the blood is from the kidney and not from the ureter.

Treatment. The surgical treatment of these cases comprises decapsulation, nephrotomy, and nephrectomy. The single case reported by Young, of the cure of this symptom by the injection of adrenalin solution into the pelvis of the kidney through a ureteral catheter, is not sufficient to form a foundation for any generalization as to its permanent efficiency.

A study of the cases treated by operation shows that the hemorrhage has ceased just as promptly after decapsulation (Freeman), or nephrotomy (Chetwood and others), as after nephrectomy, and one is forced to the conclusion that it would be better to give nephrotomy or decapsulation a trial before resorting to the more severe operation. This would be my own inclination should another simillar case come under my notice. If the hematuria be due to nephritis, it is certainly important to save as much of the kidney tissue as possible, with the view to prolonging the life of the patient.

BIBLIOGRAPHY

1. Nicholich. L'Assn Francaise d'Urologie, 1901.
2. Rovsing. Br. Med. Journ. May 19, 1898.
3. Cabot. Boston Med. & Surg. Journ., March 6, 1902.
4. Fowler. Johns Hopkins Hospital Reports, vol. xiii.
5. Baldwin. Cleveland Med. Journ. May, 1903.
6. Bouman. Monats f. Geb. u. Gyn., June, 1902.
7. Gaucher and Sergent. Rev. de Med., Jan. 10, 1901.

TUBERCULOSIS OF THE PATELLA[1]

BY JOHN B. MURPHY, A.M., M.D., LL.D.
[illegible]

CONSIDERING the frequency of primary tuberculosis of the knee joint, it is quite surprising that the patella should so rarely be the seat of the initial focus. This is still more striking when we consider the exposed position of the patella, and the frequency with which it is traumatized in infancy and childhood, the life zones in which bone tuberculosis is most common, and the close relationship which exists between trauma and bone tuberculosis, in other positions of the body. Its immunity is probably explained by the anatomic fact that it has no epiphyseal or capillary loop circulation; in other words, it is a sesamoid bone.

Primary tuberculosis of the patella has been investigated and described by a comparatively small number of surgeons and pathologists. The universal medical literature has but few references to the subject. Among the conspicuous investigators of this affection are Volkman, Gross, Röpke, Kummer, François, Schleuter, Kocher, and Chambon. Putz, of Strasbourg, in 1860, reported several cases of osteitis of the patella, and emphasized the fact that the bone is not indispensable for gait. In 1880, Albert (1) reported a case of osteitis of the patella treated by incomplete resection; the case was followed by death. Ribera Sans (2) speaks of tuberculosis of the patella in children, and its treatment by complete resection. The subject is mentioned in *Olier's Traité des resections*. The first and most systematic work on osteitis of the patella is that of François, who dealt with the subject in a Thesis (Lyons, 1888).

In 1896, Ménard, physician-in-chief of the Marine Hospital, Berck-sur-Mer, reported, at the 10th Congress of Surgery, held in Paris, 6 cases of primary tuberculosis of the patella.

E. Kummer (3), (Geneva), reports 1 case of his own, of tuberculosis of the patella, 3 from Kocher's clinic, and 3 additional communicated to him by Kaufmann (Zürich).

In 1900, Gross (4), (Geneva), published an article in which he collected 36 cases of primary tuberculosis of the patella, including 4 from his own experience.

In consulting a number of statistics on tuberculosis of the bones and joints, we find that among 1,752 cases collected by Alfer (5), the tuberculous process involved the knee in 281 cases, while the patella was involved in only two. Koenig found the patella involved in 33 out of 281 cases of joint tuberculosis, with primary osseous foci. W. Röpke, in a long and valuable article (6), reported only 8 cases from all the clinical material at the Jena clinic, from 1889 to 1904. Schlüter, analyzing 69 cases of tuberculosis of the knee joint, found both tibia and fibula involved in 21; the femur alone in 13; the tibia alone in 27; while the patella alone was involved in only 5 cases; in association with tuberculous foci elsewhere, the patella was involved in 13 cases; in the remaining 3 cases, there was synovial tuberculosis.

Consulting Cornet (Berlin) on the subject of bone tuberculosis, we find that the expression, "Primary tuberculosis" of bone is only a relative one, inasmuch as even the primary foci are always secondary to a focus elsewhere. In other words, it is a metastatic process, the infection traveling either by the blood or, rarely, by the lymphatics. The vascular metastasis is denied by some, for if this were the route through which infection traveled, the latter would have to be general. This assumption is erroneous. Bone tuberculosis is rarely transmitted from a near-by tuberculous process. In a case of Ruge, the bone tuberculosis was supposed to originate from the near-by pharyngeal tonsil. This was not demonstrated, however. Many cases of tuberculosis of the mastoid process originate from tuberculosis of the middle ear. This is neither blood nor lymphatic transmission; it is involvement by continuity or contiguity of process.

[1] Read before the Chicago Surgical Society, December, 1907.

We see, therefore, that the term "primary" is relative, and that there must always be, somewhere in the body, a tuberculous focus, which is the original atrium of infection. The tuberculous focus, in the bone, can, in turn, give tuberculous metastasis in other bones or distant organs. Experimentally, tuberculosis of the bone was produced by injecting tuberculous sputum or pus, into the blood stream, and then traumatising the bone, but it did not occur without the trauma. Such experiments were made by Schüller, Krause and Müller. That tuberculosis of the bone is secondary, is beautifully illustrated by the report of 67 post-mortems, by Koenig-Orth, who found that in 53 cases of tuberculosis of bones and joints, there was tuberculosis elsewhere, the lungs were the primary focus in 37 cases, the lymph-nodes, and particularly the bronchial ones, were involved in 21 cases; the genito-urinary apparatus was involved in 9. The mediastinal and mesenteric lymphatic glands, which filter the lymph from the lungs and intestinal tract, are commonly the seat of the primary tuberculous involvement; occasionally the lesion is so minute that it is very easily overlooked. Scrofulous patients are prone to tuberculosis of the bone. Albrecht collected 325 cases of fungous inflammations of the joints, and in one-third he was able to trace the infection to scrofula. Ruprecht, Sprengel and others, call attention to the relationship of tuberculosis of the bone and joints to the scrofulous condition of the skin and organs of special sense. It is a well-known fact that the age in which bone tuberculosis is most common coincides with that in which the lymph-nodes are more frequently tuberculous. It is very true, on the other hand, that tuberculosis of the bone may occur in *apparently* perfectly healthy individuals. The infection may take place through the skin, as in cases of injury the cutaneous lesion may be insignificant, even only an acne papule; heals very rapidly, leaving no evidence of the atrium of invasion of tuberculous infection, and yet cause tuberculosis of the bone or joint. In some cases of primary patellar tuberculosis, the initial focus could not be detected at autopsy. Among 67 cases, for example, Orth was able to find the original infection in 14 instances only. Pansini, Sprengel, and Kossel have repeatedly shown that lymph-nodes may be absolutely normal in appearance, particularly in children, and yet be the seat of small tuberculous foci. Cornet found latent foci in 4 children, out of 10, who died of diphtheria. Such lymph-nodes become caseous, and after perforating their capsule, or, being taken up by the efferent lymphatics, may spread through the lymph channels or blood stream, and be arrested at the hilum of the lung, giving the typical tuberculous adenitis of children, or may be arrested in the epiphyseal ends of bones, or in the joints, giving tuberculous osteitis or arthritis. Infectious diseases, particularly measles, scarlet fever, and pertussis, tend to the liberation of encapsulated tubercle bacilli, and frequently result in metastatic tuberculosis. Since the lymph-nodes enlarge during these diseases, by increasing their hydrostatic pressure, bursting of the glands is favored. This is probably the reason why tuberculosis of the bone is rather common after the exanthemata. So frequent is this occurrence, that it is even recognized by the laity that measles and scarlet fever commonly have bone and joint sequelæ. Another potent factor in the production of bone tuberculosis, is trauma. The latter, however, cannot produce tuberculosis unless the tubercle bacilli are already present in the blood or lymph streams. Nathan Raw (7) is of the opinion that tuberculous infection of bones and joints is produced by the bovine bacillus. The consensus of opinion is that injury to the tissues diminishes their resistance to infection; and when the tubercle bacilli escape by the injury from the lymph or blood stream, into a center of traumatic lesser resistence, favorable conditions for their development are present.

With particular reference to tuberculosis of the patella, it can be said that the primary focus generally develops during the period of most active growth of sesamoid bone, which is early adult life, and later than the more common epiphyseal tuberculous involvements. In the process of ossification, the vascularity is increased; there is a physiologic slowing of the blood stream, as there is a varicosity of the capillary loops near the line of ossification. This condition is supposed, by some pathologists, to mechanically favor the deposition

of bacteria in the tissues. The infection is not dependent upon the number of bacilli, but very much more upon the degree of their virulence, or the absence of opsonins or individual resistance. Lexer has shown that non-virulent bacteria are easily destroyed in the tissues. Frederich, in his experiments, shows that with injections of non-virulent bacilli into the arteries of the kidneys, he was unable to produce renal tuberculosis.

A tuberculous focus of the patella may open either externally, into the pre-patellar bursa, and from there rupture through the skin, or it may open into the joint, and cause the most serious complication of tuberculosis of the patella. The latter occurred in 12 out of 15 cases collected by Chambon, Ollier, François and Guillemain. Occasionally, a small sequestrum may be eliminated externally, and a repair of the tuberculous process take place. In most of the cases, however, the tuberculous process invades the knee joint. There is an anatomic reason for this occurrence, as in adults the posterior surface of the patella is separated from the knee joint by only a thin layer of cartilage, which becomes thinner as age advances, and offers but little resistance against penetration. According to Röpke, the penetration of the cartilage is facilitated by the existing arthritis, which is the result or influence of the proximity of the pathologic process to the synovial membrane. If the process is nearer to the anterior surface, the pre-patellar bursa becomes infected, and afterwards the infectious product finds its way, either through the skin in front of the patella, or travels downward, and opens on either or both sides of the upper extremity of the tibia; rarely, however, it opens to the sides or the upper portion of the patella.

Ossification of the patella begins in the fourth year, its center is in the pre-patellar tendinous tissues, and spreads in this tissue in all directions until finally it supplants the tendon completely; it is separated from the knee-joint by a thin layer of cartilage, which persists through life. There remain attached to it, below, the ligamentum patellae, and above, the quadriceps tendon. The ossification is complete between fifteenth and sixteenth year.

Age of Incidence. The age of incidence varies greatly. All the cases reported by Röpke, were between the ages of two and eight, while in the 36 collected by Gross, in which the age was known in 33, 13 individuals were under 20, while the remaining number were over that age. Billroth's analysis shows that one-third of all cases of bone tuberculosis occurred within the first ten years of life.

The symptomatology of tuberculosis of the patella can be described as it occurs in the (a) extra-articular and (b) intra-articular stages. The symptoms of the disease as classified by Forget, are: (*a*) period of pain, (*b*) period of abscess formation, (*c*) period of fistulous tract.

In the extra-articular period we may have all three stages as described by Forget.

The pain is continuous, day and night, moderately severe, and is the earliest symptom. The exposed position of the bone permits direct pressure upon the diseased focus, causing great sensitiveness. In addition to the pain, palpation may reveal irregularities on the surface of the patella. The most marked physical sign is the enlargement of the patella, both in circumference and depth. So striking this that it suggests a sarcoma rather than tuberculosis.

After a period of pain, not exceeding two or three months, an abscess may form, similar to the cold abscess in Pott's disease. It usually opens anteriorly.

The fistulous tracts, leading to the tuberculous cavity, may be one or several.

In the early stages, previous to the joint involvement, there is perfect freedom of motion, yet the patient is subconsciously cautious, and holds the knee in extension. *Hydrops genu* is an early symptom. In the more advanced cases, where the tuberculosis has extended to the joint, the capsule is thickened; there is limitation of motion and pain, and apparent articular enlargement, due to the atrophy above and below the joint, and not to bony thickening, as comparative measurements show that the diseased joint is not enlarged. The best and only reliable measure is the shoemaker's measuring rule.

Diagnosis of primary tuberculosis of the patella is rather difficult. While the focus is

small, circumscribed, and the knee joint perfectly free, the clinician seldom thinks of the possibility of a primary tuberculosis. The X-ray, at this stage, may be valueless, inasmuch as, with a small cavity, the contour and shadow of the patella may be normal, and not indicate trouble in the bone. Later, however, it gives a classic picture and greatly aids in the differential diagnosis, as is so beautifully shown in the accompanying skiagrams of our cases. Gross says that "if one bears in mind the possibility of tuberculosis of the patella, many knees will be saved." There is no doubt in the author's mind that a great many cases of joint tuberculosis have been due to primary tuberculosis of the patella. We therefore wish to emphasize the importance of an early and correct diagnosis.

One of the means of diagnosis is the use of tuberculin, which is condemned by Krausse, in his classical monograph on "Diseases of the Bones and Joints." The tuberculin of Dr. Trudeau is extensively used in Halstead's clinic in the Johns Hopkins Hospital, and according to Bloodgood (8), there have been no ill results from its use.

In our clinic we make use of 1/10 c.c. of old tuberculin in 10 c.c. of a .5 per cent carbolic water, as the working solution; 7½ minims of this solution equals 5 mg. tuberculin, which is the dose for diagnostic purposes. This produces an elevation of temperature from 101° to 103° within 30 hours after injection, which all subsides by 60 hours.

We have found a simpler, more effective, and less disagreeable means in what is known as the ocular tuberculin reaction. One drop of a 1 per cent solution of the old Koch tuberculin is placed in the left eye; a conjunctivitis results within 24 hours in all cases in which there is active tuberculosis, and persists for 48 hours. If there is no active tuberculosis, the conjunctiva will remain perfectly normal. Care must be taken not to make a second test within 10 days after the first, as the previous instillation sensitizes the eye so that a reaction will occur in normal individuals. There is rarely fever, malaise, or inconvenience in tuberculous cases, and there is no lasting disturbance to the eye.

In the differential diagnosis, we must exclude cold pre-patellar abscess, which is more fixed than a pre-patellar bursal infection or effusion. Aspiration confirms the diagnosis. Primary tuberculosis of the pre-patellar bursa is extremely rare, and all bursal tuberculosis should be considered as originating from the patella.

In the case of fistulous tracts, the integument corresponding to the fistulous opening may be covered with erythematous patches, resembling the cutaneous lesion of lupus. The absence of apple-jelly nodules in the skin, and the history of pain on pressure upon the patella, prior to the appearance of the fistulous tract, will rule out lupus.

Chronic pre-patellar bursitis, with infection, and often with sinus formation, must be differentiated from a true tuberculosis of the patella.

Treatment. If the cavity is small, the sequestrum can be removed, the cavity carefully curetted and afterwards filled with the Moorhof, or, better, with our glycero-gelatine-formalin plug. The latter is made by boiling 100 c.c. of white gelatin in 150 c.c. of glycerine and 500 c.c. of water. One to two per cent of commercial formalin is then added. It may be poured into the cavity in liquid form — it quickly solidifies, or it may be inserted as a semi-solid mass. It is powerfully antiseptic, absorbable, and non-necrotizing. It greatly stimulates tissue regeneration. In the more advanced cases, however, not involving the entire patella, one should be careful in preserving the intervening cartilage between the patella and the joint, as otherwise there is great danger of infecting the knee joint.

In a case of Held, quoted by Putz, of Strasbourg (1860), the intervening cartilage was destroyed; yet the joint was not opened during the operation, because it was previously sealed and separated from the patella by a heavy plastic exudate which protected the joint during the operation. In such cases, the patella can be removed *in toto* without danger to the knee joint.

In another group of cases, to which ours belong, the patella should be extirpated *in toto*. François and Ménard used the semilunar incision of Mackenzie, which consists of an incision with the concavity upward, running from condyle to condyle. The patella was

Fig. 6. Shows a fracture of the patella of 23 years standing. Patient walks perfectly. Ligamentous union 3½ inches long.

pushed upward, the knee flexed, which permitted the inspection of the joint. If, however, the knee-joint is involved, the case must be treated on the general plan of tuberculosis of the knee-joint.

The patella is not essential for perfect mobility and function of the knee-joint. The theory that it serves the purpose of facilitating the sliding of the quadriceps tendon on the femur, and also assists the quadriceps in transmitting its action upon the leg, is no longer tenable, according to Joachimasthal (9), and our clinical experience with fractures. Animals using their quadriceps extensively, like the kangaroo, for example, have no patella. There are cases on record of congenital absence of the patella in man with a normally functionating joint.

By employing the sub-aponeurotic removal of the patella, if possible, the bone may be reproduced. François was the first to show that sub-aponeurotic removal of the patella is followed by the formation of a nucleus, either bony or cartilaginous, generally smaller than the original patella, but physiologically its equivalent. The technique of our procedure is as follows:

a. Preliminary preparation of the joint, which consists of producing a chemical inflammation in the joint by injecting 2 to 6 drams of 2 to 5 per cent solution of formalin in glycerin (which is prepared 24 hours before needed), a week or ten days before the operation. We induce this chemical inflammation preparatory to all arthrotomies for patellar fractures, movable cartilages, etc. By the preparatory treatment of the joint, a local immunity is developed, through the infiltration of the tissues, and the occlusion of all the lymph spaces, induced by the chemical inflammatory reaction. Trauma, in the way of dissection or handling in these joints, will not produce a large quantity of effusion, as it does in non-immunized joints. They offer a much greater resistance against infection.

Fig. 1. Line of incision.

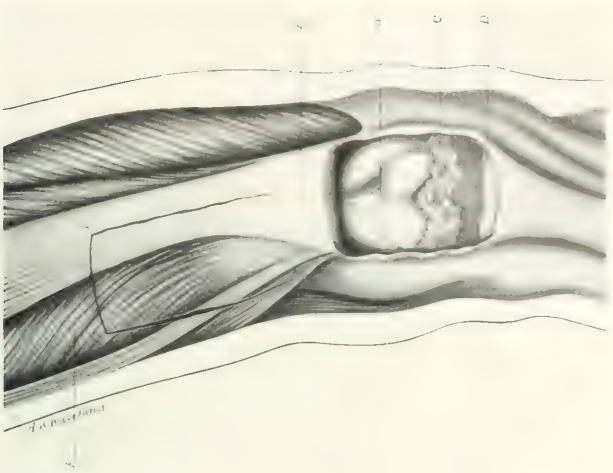


Fig. 2. Anterior view of the joint with the patella excised.

b. Open the knee-joint by a 7-inch incision in the outer side of the patella (from a to c).

c. Make a sub-aponeurotic excision of the patella (from c to d), leaving ends of quadriceps tendon and ligamentum patellæ exposed.

d. Prepare the flap, for the extension of the quadriceps tendon downward, by splitting the quadriceps tendon and vastus externus muscle from point (*h*) to point (*e*), dividing the vastus externus transversely to (*j*), and splitting it back to (*i*); then turn the flap downward, with its fascial side to the joint, and approximate point (*h*) of the flap to (*d*) of ligamentum patellæ, and point (*j*) of flap to (*g*) of liga-

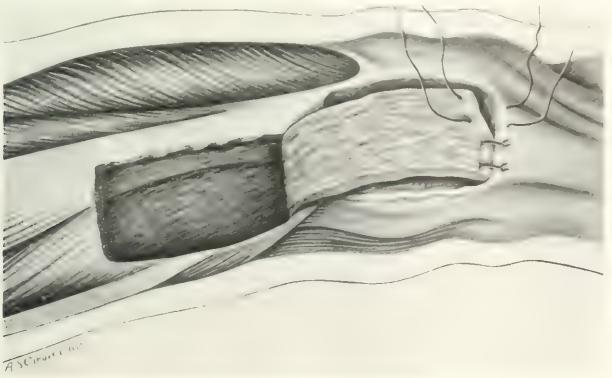


Fig. 3. (Case 1) Extension-flap placed in position.

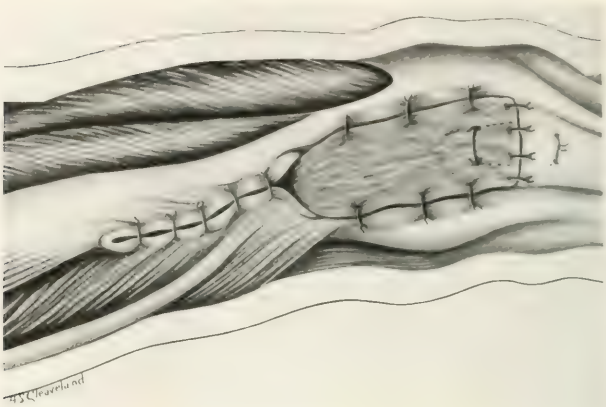


Fig. 4. (Case 1) Showing line of suture for flap and closure of rent in quadriceps muscle.

mentum patellæ. It may be united end to end, or may overlap the patellar ligament. The fascia and its fat should be turned toward the joint. This flap is used as a substitute for the patella and is an extension of quadriceps tendon. The suture is done with kangaroo tendon, silk or chromicized gut, or it may be accomplished with a figure-of-eight silkworm gut suture, supporting the outer loop with a gauze pad, so that it does not cut into the skin. This is probably the most desirable, as well as the strongest, method of suture.

e. Suture the aponeurosis of patella securely to the divided edge of the deep fascia, and continue until the quadriceps tendon and muscle are entirely embedded. Close the rent left in the vastus externus by buried catgut sutures.

f. Insert a superficial drain from the joint surface to the lower angle of the wound.

g. Dress in a straight posterior splint.

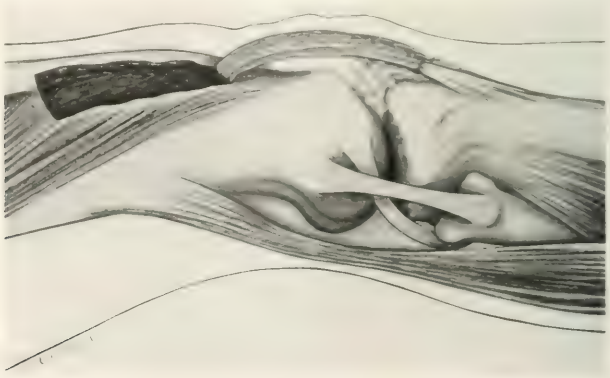


Fig. 5. (Case 1) Showing lateral view of the joint, showing the quadriceps extensor flap.

This was the technic followed in both of our cases, with the results as indicated in the accompanying photographs.

HISTORY. CASE I

June 10, 1904, Patient, C.L.H., Milwaukee, Wis. Occupation, salesman. Age, 37 years. Sex, male. Sick, 5 years.

Family History. Mother living. Father died of paralysis at 56 years. Three sisters, two brothers, all living.

Personal History. Married 2 years; no children. Wife living.

Previous Illnesses. Measles when a child. Slight attacks of rheumatism.

Present Trouble. About 6 years ago, patient, in passing by a counter in his store, struck his right knee cap upon a sharp projecting piece of wood.

Following this the knee began to swell and was very painful; but patient continued at work for about six days after the injury. At this time the knee became very painful and patient was obliged to go to bed; was laid up for two months, and had the leg in a cast. After this the swelling left the knee and patient returned to his work. Knee had resumed its normal size and was not painful.

Fig. 6. (Case 1) Shows conditions of patella, January 22, 1900.

Fig. 7. (Case 1) Showing the honey-combed condition of the tuberculous patella 6 months before operation, January, 1904.

About 3 months later, patient was laid up for 3 weeks with a similar attack, but without preceding trauma. Shortly after this the patient went to Hot Springs and was treated, but knee did not improve; remained painful and swollen. *Pain was most intense in the night.* Since then patient has worked most of the time, but his knee was always painful and weak. About two or three times a year it would swell up and become very painful, incapacitating him for a week or two. Appetite usually good. No gastro-intestinal, nor urinary symptoms. Patient lost no weight.

Physical Examination. Shows a patella $3\frac{1}{2}$ inches in diameter and almost circular, i.e., enlarged in all directions, and elevated apparently an inch above the normal level. It is irregularly nodular on the surface and margins, and very sensitive to continued pressure. There is a moderate degree of effusion in the joint. The skin is not adherent to the patella; it is movable on the femur; voluntary extension is perfect, but flexion could be carried only to a right angle. There was no thickening of the capsule, and none of either the tibia or femur.

Skiagram (Fig. 6) shows condition of patella January 22, 1900, and skiagram (Fig. 7) of January, 1904, shows the advance made by the disease in 4 years.

Skiagram (Fig. 8) shows the normal right patella (January, 1900) for comparison.

HISTORY OF OPERATION.

Preparation. Usual preparation. Rubber acetone solution.

Fig. 8. Case 1. Showing normal patella in the same patient.

Fig. 9. Case 1. Shows the honeycombed condition of the patella, 4½ years before operation.

Pathology. Many granulating foci present in patella, tuberculous in origin. Foci have ruptured through the articular surface, producing scars on the articular surface of the cartilage. One sinus had recently ruptured. Patella was riddled with sinuses. Proximity of foci to the articular surface produced recurrences of acute synovitis. (Mentioned in the history). No other tuberculous foci found.

Operation. 1. Lateral incision. Patella dissected out. Synovial membrane opened. 2. Synovial membrane closed with continuous cat-gut sutures. 3. Row of continuous kangaroo tendon sutures between ligamentum patellæ and aponeurosis patellæ and quadriceps extensor flap. Horse-hair in skin. Three-quarters anterior splint.

In a recent letter, the patient states: "I send herewith photographs of my leg. The operation turned out a perfect success and since have been able to use it fully as well as the other; even in going up or down a hill or stairs, it does not inconvenience me in the least."

Fig. 10. Case 1. Showing the degree of voluntary extension 3 years after operation.

HISTORY. CASE II

M.DeR., referred by Dr. F. G. Dyas.

Family History. Negative.

Personal History. Male, aged 27 years; married, 4 years; 2 children, both well and healthy. Born and

Fig. 11. (Case 1) Showing patient standing on the limb 3 years after operation.

always lived in Chicago. Uses 3 to 4 cups of coffee daily. For last 4 years used alcohol in moderation; 4 years previous to this was a hard drinker. Romberg sign absent. Pupils react in both accommodation and light. There is no muscular incoördination. During the past year has at irregular intervals, perhaps to the number of 15 or 20, experienced girdle sensations, describing them "as though some one had a rope around the body and was pulling on both ends."

Past Illness. Measles and typhoid fever during childhood, uneventful recovery; also had skin lesions on anterior surface of both legs during early childhood, scars now present showing location of original trouble. Ten years ago was operated for appendicitis, making a good recovery. Two years ago was operated for hydrocele. During the past three years, at irregular intervals and always following exposure or chilling, has had "rheumatic pains" in muscles of arms and chest.

Present Complaint. Began two years ago with sudden onset; while patient was in bed, convalescing from his hydrocele operation, he experienced sharp, sticking pains in the left patellar region (gives no history of any injury, slight or otherwise, to left knee). These initial pains lasted a few hours and then the character changed to a dull ache, which was constantly present. This was lessened when he threw the weight of his body on his left foot. Says that from the first he noticed a slight swelling of the left knee and the left patella seemed larger than the right one; says that in the next six months the increase of swelling of the knee and the enlargement of the patella were very slow, but progressive.

Six months after the onset of the trouble, while stepping up on a curb-stone his foot slipped and he made a violent effort to regain his equilibrium, which prevented his falling, but at the same time he experienced a sharp, severe pain in the left patella; also a feeling of something giving way there. He was unable to step on his left foot and describes the pain as being excruciating. He was about a block from home and alone at the time. Says that it took him over a quarter of an hour to cover the distance, hopping on one leg and hanging to railings and supporting himself by leaning against the walls of buildings. He fainted when he reached his own door-step. (This was a pathologic fracture of the patella as shown in skiagram, Fig. 12.) The knee swelled and the next day was about three times its original size. The swelling and acute pain gradually subsided, and he was able to bear part of his weight on his left leg in about a week and a half. Since that time he has had a continuous dull pain, and has been unable to extend the leg on the thigh. At irregular intervals, pain was more severe, with more or less swelling, lasting a few days and disappearing after giving the injured part a rest. There has never been any redness of part during these attacks. There has been a steady loss of weight, with a continuous decrease in general strength, in the past two years, the loss in weight being about 30 pounds.

During the past three years has had night sweats nearly every night and says that there has been an evening rise of temperature, but not as often as the sweats. An-

Fig. 12. (Case 2) Showing pathologic fracture at the line of tuberculosis before operation.

Fig. 13. (Case 2) Showing the degree of voluntary extension 7 weeks after operation.

Fig. 15. (Case 2) Showing the degree of voluntary flexion 7 weeks after operation.

other thing patient mentions is, that after any attempt at exertion (mental or physical), the left knee (anterior surface) is bathed in copious perspiration, which is localized in this area.

Examination. The patella measures 4½ inches in length and 3½ inches in transverse diameter; it appears to be elevated ½ inch above the normal level. It has a transverse crease across its center, at the line of pathologic fracture; the fragments are slightly movable on each other. The margin is irregular, and there is effusion into the joint.

Ten days ago, left knee was aspirated; about two ounces of serous fluid was removed; the knee was injected with 1 ounce of 2 per cent formalin and glycerine solution. There was considerable increase in the synovial fluid for two days and then absorption rapidly took place.

Pathology. Tuberculosis of the patella, with foci

Fig. 14. Case 2. Showing voluntary extension in the erect position, 7 weeks after operation.

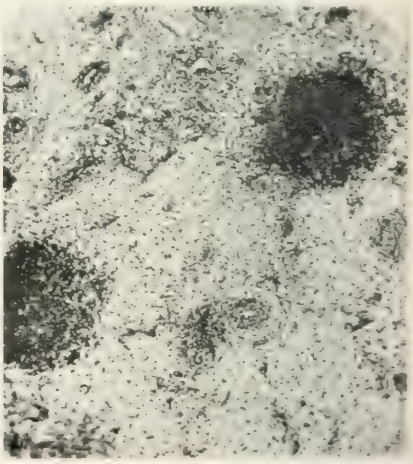
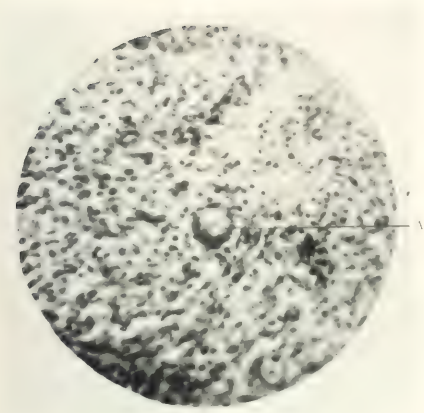
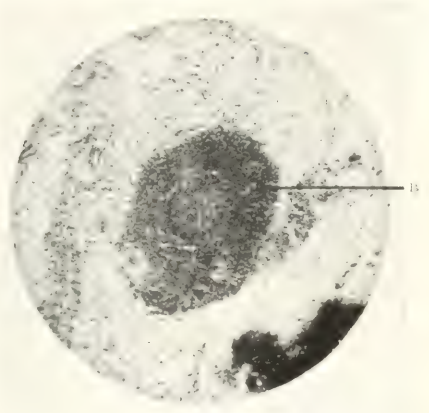


Fig. 16. Case 2. Mr. DeK. A. A. Tubercles, low power.



Case 2. Mr. D. R. A. Giant cell — high power.



Case 2. Mr. D. R. B. Tubercle — high power.

involving both upper and lower fragments. A fracture a little below the middle. The patella was completely excised with its synovial membrane. The synovial membrane throughout was very hyperæmic and infiltrated, the result of the formalin and glycerin injection. No evidence that the tuberculous process had penetrated the synovial membrane into the joint. No foci of tuberculosis in the joint.

Tube inserted. Technic exactly as in case 1.

Admitted September 11, 1907. Operations September 11 and 21, 1907. Dismissed October 26, 1907. Highest pulse and temperatures: 16th day, p. 108, T. 100 26th day, p. 114, T. 100; September 22nd, 6 p.m., p. 112, T. 100-4/5.

(Figs. 13, 14, and 15 show the degree of motion 7 weeks after the operation.)

The patient left the hospital with complete healing, and was able to flex the knee to a right angle. When presented, on December 5th, to the Chicago Surgical Society, he could walk without a limp, so that one could not discern, from his gait, which limb had been affected, and he could extend the leg on the thigh perfectly, and flex it to a full right angle. He had no pain or discomfort, and a cursory examination would not even reveal the absence of his patella.

BIBLIOGRAPHY

1. Albert. The London Medical Record, 1886.
2. Ribera Sans. Revue de Mèd. et Chirurgie.
3. Kummer, E. Revue Médicale de la Suisse Roma de, 1889, 9, p. 721.
4. Gross. Ibid., 1900, p. 109.
5. Alfer. Bruns' Beitrage, 1891, vol. viii, p. 278.
6. Röpke, W. Arch. f. Klin. Chir., 1904, vol. 73, p. 492.
7. Raw, Nathan. Brit. Med. Jour., Feb. 2, 1903.
8. Bloodgood. Progressive Medicine, Dec., 1902.
9. Joachimasthal. Langenbeck's Archiv., 1902, bd 67, heft 2.

PROPHYLACTIC USE OF THE FILIGREE IN INFECTED WOUNDS OF THE ABDOMINAL WALL[1]

(Experimental Part from the Physiological Laboratory of Washington University; Clinical Part from St. Anthony's Hospital.)

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At the Boston meeting of the American Medical Association, I presented a report of twenty-two cases, in which I had made use of an original filigree, for the treatment of post-operative hernia and allied conditions. Five years' experience with the contrivance was crystallized in the following concluding statement in that paper:

"My results, detailed above, have proved, I trust, that the contrivance does not absolutely need to have a clean wound for its bed, and that it will also stand the strain incident to pregnancy, and other rigorous conditions. Not one of my patients died as a result of its use; not a single filigree of the twenty-two gave cause for removal; nor have I a failure to record after its use."

It is not the purpose of *this* paper to discuss further these twenty-two cases, which have been reported fully in three articles, viz., 1. An improved filigree for the repair of large defects in the abdominal wall (*Annals of Surgery*, July, 1903). 2. Additional cases in which the author's silver filigree was used for the radical cure of abdominal hernia (*Interstate Medical Journal*, vol. x, No. 9). 3. Five years experience with an original filigree, intended to prevent and cure abdominal hernia (*Journal of the American Medical Association*, September 8, 1906). I will not go especially into detail concerning the more recent fourteen instances, except those where the filigree was used in a suppurating wound. Of this last named variety, six cases are fully reported below.

At the expiration of six and one-half years, since the method was introduced, I have used it thirty-six times and still have no reason for regret. There has been one recurrence, as will be detailed later, owing to an improper experimental use of the device, and one filigree was removed by mistake. This was in Case 27. A young woman, with a post-operative hernia, was treated by the implantation of a filigree, and at the same time a retro-displaced uterus was attached to the anterior abdominal wall by a silk thread. Infection of the wound occurred, and a sinus, leading down to the thread, persisted several months. In attempting to remove the silk I so distorted and displaced a portion of the filigree that I thought best to remove it. This was partially accomplished, but with the greatest difficulty, although it had not been sutured in place.

Since I commenced this work I have been more and more impressed with the fact that the patients whom I get for these operations have experienced suppuration in the original wound; hence, it is only natural that I should have considered a means of saving them the annoyance of a second hospital experience, to say nothing of the suffering, disability, and danger in the interim.

Just how many suppurating abdominal wounds result in hernia was determined, some years ago, at the then famous Mikulicz Clinic, in Breslau. They studied the laparotomy wounds of years past, and found that just two-thirds of those which had become infected were later the seat of hernia.

From my series of thirty-six filigree cases, six have been selected in which a filigree was implanted in an already infected wound. A brief description of each follows:

Case 15. A boy, 12 years of age, had been operated upon for purulent appendicitis two weeks earlier, and on October 31, 1905, I placed a small filigree beneath the muscle edges of his wide open wound. A fair test of the contrivance, was, however, not made in his case, since his physician, becoming alarmed at other complications, removed the filigree without my knowledge. The boy ultimately recovered.

Case 16. A young man had been drained for appendix trouble by an assistant of mine, three months

[1] Read before the Clinical Surgical Society, January 8, 1907.

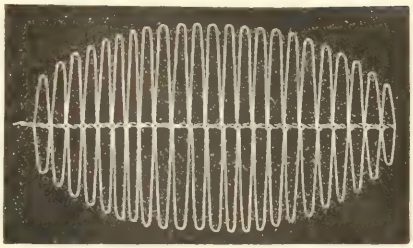
before I saw him, but the little offender had not been found and removed. When I operated upon him there was great difficulty in locating it, but this was finally accomplished, and, in spite of the fact that much pus was encountered, I implanted a small filigree beneath the edges of the aponeurosis. This was done on November 17, 1905: the wound healed slowly; he is now at work with a firm abdominal wall, and experiences no trouble from the wire.

Case 25. This is a most interesting case and teaches a valuable lesson with reference to the use of the filigree. In this instance I removed a fibro-myoma of the uterus, also two complicating pus tubes. Apparently the abdominal fat was infected at that time, since the wound suppurated profusely, necessitating its being opened in its entire length to the depth of the aponeurosis. The patient was a very stout washerwoman, accustomed to lifting heavy weights; hence, on June 14, 1907, I implanted a large size filigree in front of the aponeurosis, supposing that this would answer all practical purposes. This was done one month after the original operation, but as soon as she got out of bed a bulging was noticed, which very soon developed into a hernia as large as a cocoanut, thus demonstrating conclusively that it is improper to implant a filigree in the abdominal fat; the edges of it must lie behind aponeurosis or muscle. This is the only instance in which I ever placed it in the fat, and the only recurrence which I have to record.

Case 31. A boy, 16 years of age, was drained for appendicitis by one of my assistants during my absence from the city. About two weeks later I opened his abdomen for a secondary collection of pus in the pelvis, and at the same time removed his appendix. By both of these operations his abdominal wall was very considerably damaged; hence, on July 10, 1907, three weeks after the second operation, I implanted a filigree beneath the aponeurosis, with the result that he was up in two weeks; has been back at work for the past five months, and notices no bulging or discomfort.

Case 32. This patient, a man, 28 years of age, was operated upon for suppurative appendicitis by one of my assistants, and the appendix removed. A fecal fistula developed, and a greatly weakened segment of the abdominal wall was the result. Ten days after the first operation, two days after the fecal fistula had closed, on September 21, 1907, a filigree was introduced under the aponeurosis. An iodoform dermititis of the most severe variety resulted from the packing of the defect between the lips of the wound. However, he was out of the hospital in less than three weeks, and in four weeks walked in to announce that his wound was completely healed and he himself ready for work again.

Case 36. A lady, 33 years of age, was subjected to the Wertheim procedure for cancer of the uterus. A few days later the skin sutures had to be removed to evacuate a large quantity of pus which had accumulated in the fatty layer. She was a very fleshy woman, accustomed to doing her own housework, and, fearing a hernia, we implanted a filigree beneath the recti two weeks later, on November 27, 1907. An instructive feature of this case is that the lips of the wound were approximated in a part of its extent, and no packing



This filigree is woven of No. 30 silver wire; the method of construction makes it so pliable that the natural mobility of the tissues is unhindered by its presence.

used between them. This is the only patient in the series who developed septic symptoms after this form of operation. Her temperature went up to 103½, and the lips of the wound had to be separated slightly to admit the escape of pus. The three sutures were loosened somewhat, though not removed; the filigree was not disturbed; she was placed on her abdomen to allow the escape of pus, and no further harm resulted.

One filigree was removed, as above stated, by mistake and without my knowledge. The other five do not constitute a large number, but surely enough to prove that a pus wound, with a filigree in it, heals in very much the same manner that any other granulating wound is supposed to do. The periods which have elapsed since the five permanent implantations are as follows: two years, one year, six months, four months, and two months; a total of fifty months, that is, an average of ten months to each patient. As stated in Case 25, one recurrence was noted when the contrivance was used in the subcutaneous fat; with this single exception, every one of these abdominal walls is normal. There is nothing to attract the patient's attention to the filigree containing scar.

OPERATIVE TECHNIQUE.

1. The wound is carefully cleansed and dried in order that any exudate which may be present shall not be accidentally spread.

2. By blunt dissection the previously cut edges of the anterior rectus sheathes, or better still, the edges of the recti muscles, are elevated, and these structures separated from their posterior sheathes for the full length of the wound, and laterally far enough to accommo-

date a filigree of the size desired. (In case the wound does not happen to lie in the median line, other muscles, together with their fascial coverings, may be treated in a similar manner in any portion of the abdominal wall.)

3. The cavity thus made is packed for a moment with gauze, soaked in Harrington's solution No. 9, in order to seal up all the open tissue spaces and prevent the dissemination of infective material.

4. A filigree, the size of the cavity which it is to line, is inserted, and the lower end anchored with a catgut suture in the lower extremity of the wound, since this is the point at which intra-abdominal tension will be greatest when the patient is in the erect posture.

5. If the wound be not more than eight centimeters in length, one suture is sufficient. A strand of silk-worm gut is carried through all the structures overlying the filigree, but is not tied in the usual manner. Each end is knotted to a button lying on the skin, to either side of the wound, thus leaving an open cavity, the walls of which approach one another to within one centimeter. This small defect is lightly packed with iodoform gauze, to facilitate drainage. In the case of a longer wound, two or three similar sutures may become necessary. This gauze packing is left in situ several days, and not replaced when it is once removed. The dressings are changed as often as necessary.

It is very interesting to watch one of these wounds after the filigree has been implanted. In a very few days granulations have so completely covered it that it cannot be seen from the front.

I do not wait to get these people up and out of the hospital until the skin has completely formed over the defect, nor do I consider this necessary. The stitches are cut and the patients are allowed to get up at the expiration of two weeks after the implantation, and this having been done usually about two weeks after the original operation, they really do not remain in bed as long as do many whose wounds are simply drained and allowed to heal by granulation.

As to the proper time for implanting a filigree in a pus wound, no rule which will cover all cases, can be laid down; I will merely state that I have usually waited until general conditions were favorable, that is, until the wounds were clothed with healthy granulations, and free from gangrenous tissue, or pockets in which pus accumulated. Naturally, fistulæ, fecal and otherwise, must be disposed of before a proper bed for a filigree can be established.

In this series of cases the intervals which elapsed between the original operation and the implantation, was in 1 case, one month; 3 cases, two weeks; 1 case, ten days; 1 case, none.

I can imagine appendix and other cases in which the wall is soiled enough to preclude ordinary suture methods, cases in which a supplementary drain might take care of intra-abdominal exudata, as fitted for the implantation of a filigree while the patient is on the table for the first time, although, as I say, but one such has presented itself to me, viz., Case 16.

Dr. Ochsner's remarks, in discussing a paper which I read on an allied subject at Boston in 1906, suggested to me the advisability of X-raying some of these patients, to find out exactly the present status of the filigree. He stated that wire sutures in the abdominal wall had the unfortunate tendency to break into little bits, and, by irritating the skin, necessitate removal. I managed to induce two of my older patients to submit to the procedure, choosing especially those in whom it was impossible to close any of the abdominal layers, excepting skin and peritoneum, cases in which the affected portion of the wall then consisted of skin, wire, and peritoneum.

The first of these was Case 3 of my entire series. She was examined five and a half years after the implantation of two filigrees for one of the worst post-appendiceal herniæ which I have ever encountered. The plate showed two filigrees still in place, one over the other, although some one-third of the cross wires were broken. In spite of this there is no bulging at the site; there has never been any complaint from the presence of the wires, nor has she worn any form of bandage or supporter since my operation.

I further examined Case 14, more than two years after the implantation of one of the largest filigrees I ever used. In this instance, I had divided the abdominal wall in the median line, from the pubis to a point consider-

ably above the umbilicus, for the removal of a large uterine fibro-myoma, as well as for the treatment of a good-sized umbilical hernia. In this instance, I could not approximate the atrophic recti, or anything else but skin and peritoneum, in about one-third the length of my incision. The X-ray plate showed the filigree nicely in position, but few of the cross wires being broken. The result is here perfect from every standpoint. There is no complaint regarding the presence of the contrivance, and she has not worn a supporter for one and a half years.

A still more interesting case is one related to me by Dr. Carman, of this city. A patient was sent to him for X-ray examination, and to his surprise he found the broken up remnants of a wire net work in the abdominal wall. On inquiring into her history it came to light that she had been operated upon three times for a post-operative hernia, which was finally cured the fourth time, a couple of years since, by the introduction of a filigree.

These three instances are enough to show that the filigrees do break up, to some extent, in the wounds, but make no symptoms in consequence, in cases where they have not been placed too close to the skin. It is, however, important to note that these cases are as completely cured as though the wires had remained intact. My records, extending back six and one-half years, sand covering thirty-six cases, demonstrate this point conclusively. I do not know whether it is that the wires which do remain intact offer sufficient support to keep the scar from stretching, or whether it be that the presence of the contrivance leads to the formation of such an excessive scar that it will not stretch, even after the wires break; but this much I must insist on, that many patients are well to-day, years after I substituted skin, wire and peritoneum for a large hernial opening. It will be granted at once that skin and peritoneum *alone* are not effective in maintaining the integrity of any portion of the abdominal wall.

In order to study the results of implanting filigrees in infected wounds in a dog's abdominal wall, I secured a male, black, mongrel dog, weighing eighteen pounds, and on November 18, 1907, implanted three filigrees, 2 x 4 centimeters in size, in the following situations: One high up in the middle line, beneath the recti muscles; one close to the free margin of the ribs, on the right side, beneath the edges of the external oblique muscle, and one on the left side, high up, and just under the skin. In each of these instances, one stitch was used for drawing together the tissues superimposed upon the filigree. No aseptic precautions were observed; a large cotton dressing was applied, and the animal turned loose. A few days later he was found to be in perfect condition but minus a dressing. All three wounds were completely healed in twenty-four days, there being a stitch abscess in the median as well as in the left of the three. There was absolutely no bulging, although the animal had been active all this time, and without a supporter or the slightest attention.

In order to study the effects of increased intra-abdominal tension upon such a wall, the following experiments were made: As a trial of our projected method we killed and skinned a four-pound adult female cat on December 13, 1907. A canula, connected with a hydrant, as well as with a mercury pressure gauge, was tied in the rectum and the stream of water turned on. The mercury rose to sixty centimeters, when water gushed out of the open œsophagus into a wound in the neck. After this had been secured by clamping the animal's neck, the stream was once more turned on with the effect of something giving way inside at fifty-eight centimeters. We could not determine at the time whether this was an intestine or the diaphragm. With the third attempt the right inguinal region blew out, the mercury standing at forty-three centimeters. Our only explanation for this segment of the abdominal wall giving way under a much lower pressure than it had sustained earlier in the experiment, is that the water we used exerted a deleterious effect upon the tissues. With this idea in view we decided to use salt solution in our future work of this nature.

On December 14, 1907, twenty-six days after the three filigrees had been implanted, we killed the dog to which reference has been made. His neck was clamped, a canula tied in the rectum, and after he was skinned (except the immediate vicinity of the three scars), salt

solution was injected into the abdomen. Immediately the loops of intestine could be seen filling up. At thirty-five centimeters the stomach ruptured, and the contour of the abdomen became absolutely symmetrical. It was noted at this time that the œsophagus was distended with fluid below the clamp which held it. With the mercury at fifty centimeters, the right of the three wounds blew out, that is, the one in which a filigree had been placed below the edges of the external oblique muscle. The specimen is presented herewith for your inspection. The interior abdominal wall shows wide omental adhesions at the site of the median filigree, which, it will be remembered, lay beneath the recti, whereas the left of the three contrivances, which was placed in the fat, was found to be freely movable on its base, and consequently afforded no protection whatever.

It is gratifying to note that the wound treated in just the way I have advised in these cases stood the greatly increased pressure from behind, as did normal segments of the abdominal wall, and this only twenty-six days after the filigree had been implanted in an infected wound. Behind this contrivance was nothing but peritoneum and an extremely thin transversalis fascia; in front of its median portion, nothing at all, until granulation tissue changed to scar.

It seems that the solution of this problem resolves itself into three questions:

1. Does a filigree protect against hernia in general? My own experience, with thirty-six cases, covering a period of six and a half years, seems to me to prove this point without a doubt.

2. Will a filigree heal in a pus wound? That such is the case I have shown to be true in five instances above mentioned, as well as in an equal number where a clean wound became infected after the implantation of such a contrivance.

3. Is any protection needed against the occurrence of rupture in an infected wound? The experience of the surgical world answers this question, and demonstrates conclusively the likelihood of a post-operative hernia under such circumstances.

If then a filigree does protect, will heal in an infected wound, and some sort of artificial aid is needed in these cases, may I not, reasoning on these premises, logically conclude that a filigree is of value in an infected wound? Surely prophylaxis is to be preferred to any therapeutic measure. Why not then implant a filigree before a hernia makes its appearance, since this has been shown to be free from any undesirable consequences?

THE DIFFERENTIAL DIAGNOSIS OF DUODENAL ULCER AND GALL-STONES[1]

By W. D. HAINES, M.D., Cincinnati, Ohio

PROMINENT symptoms in common are pain, vomiting, and gas; together with the deleterious influence which these symptomatic manifestations exert on the general health of the patient.

It is to a correct interpretation of these symptoms and their influence that we must turn in an attempt to distinguish the two diseases, essentially distinct entities yet closely related symptomatically and anatomically. Both complaints are referred to the upper right quadrant of the abdomen, and while the pain in cholelithiasis, which is sharp, decisive and of sudden onset, is referred to a point opposite the right ninth costal cartilage, it may radiate over the entire right side of the abdomen and not infrequently finds expression in the right shoulder joint. Again, the pain may be most intense in the region of the tenth dorsal vertebra.

Jonas has shown that the gall-bladder and ducts receive their nerve supply from the terminal filaments of the four lower dorsal and two upper lumbar nerves. The nerves,

[1] Read before the Western Surgical and Gynecological Association, December 29 and 31, 1907, St. Louis, Missouri.

after leaving the cord, pass forward, over the diaphragm and between the folds of the gastro-hepatic ligament. This explains not only the pain in the back but also the diaphragmatic spasms which so often accompany gall-stone attacks.

The attack causes the sufferer much anxiety; profuse perspiration and vomiting follow shortly after the first onslaught of pain, and great exhaustion remains after the paroxysm has subsided.

Vomiting, if present, is characteristic in that the ejected matter is bile-stained, consisting largely of mucus and affords no relief to the patient. Hot fomentations may give temporary relief, but full doses of morphine are usually required to allay the terrible suffering.

The symptoms disappear as suddenly as they came, and the patient in the course of a few days will show little trace of the scourge through which he has so recently passed.

In duodenal ulcer the pain recurs at intervals, is less sudden of onset and severe in character; it is described as a burning or gnawing sensation which may last a few days or continue for months after the primary attack.

Unlike the lancinating pains of gall-stones, pain in this disease is markedly influenced by the presence or absence of food in the stomach. A certain degree of relief invariably follows the ingestion of a full meal, lavage of the stomach, or the drinking of a quantity of alkaline fluid.

The explanation for this is found in the dilution or neutralization of the stomach secretions, which are always hyper-acid in the early history of duodenal ulcer. The pain or distress in ulcer cases is greatest four or five hours after a meal has been taken, and is due to the passage of stomach contents over the sensitive, ulcerated mucosa lining the duodenum.

Spasm of the pylorus is a frequent accompaniment of ulcer, but wholly unknown in early gall-stone cases.

Spasm of the diaphragm is evidence of severe pain, which if referred to the region under consideration indicates gall-stones, as ulcer pain, in the absence of perforation, is not of sufficient severity to produce this symptom.

Gaseous distention speaks for ulcer, and the accompanying pain quickly subsides after expulsion by eructations or vomiting. In the absence of pyloric spasm or obstruction, with a fair degree of stomach motility, ulcer cases feel best immediately after taking food.

Muscular rigidity and local tenderness are present in both ulcer and stone cases. Mr. Moynihan told the writer that he had frequently observed a small hypersensitive spot in the skin covering the abdomen, directly over the ulcerated area. It is no larger than a sixpence and he attaches much value to this phenomenon in differentiating ulcer.

It has been definitely determined by clinical evidence and operative procedure that pain in duodenal ulcer is due to:

a. Passage of acri-acid stomach contents.

b. Distention by gas.

As an illative consequence, pain or distress will be greatest in those cases of excessive acid or great distention; on the other hand, very little discomfort may be present in ulcer cases where little, or as Einhorn has said, "No acid is found."

It is in this last variety of ulcer, latent it is called, whose first symptoms may be those of perforation, that the diagnosis is impossible until the calamity of rupture presents.

Vomiting is of less value as a symptom than either pain or distention, but it is well to remember that vomiting is full and free, followed by marked relief, and ceases promptly in ulcer cases, leaving little depression and no nausea. No relief is obtained nor does vomiting cease with emptying stomach contents in stone cases, but a continuous nausea and occasional vomiting of bile-stained fluid continue throughout the attack in recurrent cases. If the diagnosis is established early and treatment instituted at once, vomiting may never appear as a symptom in gall-stones.

In late or recurrent gall-stone histories, vomiting is a prominent feature and the same may be said of chronic ulcer, but the slight, transitory disturbance of the one and the invalid dealing influence of the other, will materially assist in putting one right in the diagnosis.

The far-reaching, baneful influence of the lack of nutrition or the calamity of perfora-

tion are the features most prominent in many ulcer cases when they reach the hands of the surgeon. The patient eliminates one article of diet after another, until he is reduced to starvation rations ere relief of more or less permanency is obtained.

Hemorrhage occurring during an attack of gall-stones is accidental, but it is prominent as one of the late manifestations in ulcer.

One of the first indications to attract the attention of the observer may be the presence of blood in the stool, but one should not forget it is a late and dangerous symptom, and that small hemorrhage from duodenal ulcer may be followed by great depression, collapse, and fatal termination.

Jaundice, like hemorrhage, is a late symptom, and may be present in either of the conditions under consideration. This symptom is more constant in stone than ulcer, and while the obstruction is most frequently due to the lodgment of a calculus in the former and an inflammation of the choleductus in the latter, adhesions may produce jaundice in both diseases in the absence of either of the above factors.

Jaundice, following lancination pain of sudden onset, localized in the upper right quadrant of the abdomen, radiating over the right chest wall or accompanied by pain in the right shoulder, would warrant a conclusion of the presence of gall-stones. Do not, however, be surprised if ulcer is found to co-exist with stone, as the initial pathology is, according to many competent observers, one and the same, that is, altered stomach secretions.

Constipation is one of the early effects of duodenal ulcer. It may be present very early in the history of the disease, and is due to altered secretions, absence of flora, pylorospasm, and motor insufficiency. Constipation may be very obstinate and constitute the dominant note in the history.

Although the well-known, significant clay-colored stools are pretty constantly present in gall-stones, constipation is the exception rather than the rule in these cases.

By a careful reading of the early histories of these afflictions one may be fairly accurate in his decision, but in the old cases, where repeated attacks have resulted in inflammatory adhesions, impacted stone, pancreatitis, and impaired motor and secretory stomach function, with their blighting influence upon the general economy, one is confronted by an almost endless pathological chain, whose correct interpretation is exceedingly difficult.

Finally, in a certain percentage of the chronic and some of the acute cases of stone and ulcer, differentiation will be reserved for that erstwhile, much used, sometimes abused, method of diagnosis, "Exploratory incision."

DEPARTMENT OF TECHNIQUE

PREPARATORY AND POST-OPERATIVE TREATMENT[1]

By JAMES E. MOORE, M. D., Minneapolis

As a rule, preparatory and post-operative treatment, aside from the sterilization of the operative field and the dressing of the wound, have more to do with the comfort of the patient than with his recovery, for emergency cases very commonly do well, and we frequently perform successful operations away from home and leave the after treatment to a physician little skilled in the care of surgical cases.

In all but exceptional cases, where some organ — the bladder for example — has to be prepared for operative procedures, prolonged preparatory treatment is unnecessary and inadvisable. It is not in keeping with modern surgery that we should "operate our patients off the street," but it is sufficient to have the average patient enter the hospital on the day preceding the operation.

Much harm is being done by starving patients and giving them heroic doses of cathartics before operation. An operation of sufficient importance to require any preparatory treatment is a trying ordeal for the patient, and should be prepared for as for any other trial of endurance. The patient's resisting powers should be brought up to the highest possible standard. We should not think of preparing a person for any other trial of his strength by hypercatharsis and starvation diet. On the contrary, we should give him good, nourishing food and keep his bowels regular. If a patient were to come to us weakened by a diarrhœa, we would naturally build him up before performing an important operation upon him. Why then should we weaken him by cathartics before operation? When a patient's bowels are regular, he is better without a cathartic, except in abdominal and rectal cases, and he should have regular diet up to within a few hours of the time of operation.

In weak patients, and where a very severe operation is to be performed, a hypodermic of one-thirtieth of a grain of strychinia just before operation is helpful.

The operative field should be shaved, thoroughly disinfected, and a sterile dressing applied the evening before the operation. The application of wet dressings and soap poultices at this time are objectionable, because they are unnecessary, and are very liable to deprive the patient of a necessary night's rest. The field should be thoroughly rescrubbed with soap, water, and gauze just before the operation. It is a mistake to use a stiff brush, so that the skin looks like a boiled lobster. Bichloride and other chemical solutions are usually applied at this time from force of habit, but, as now used, their value is certainly questionable, and they will doubtless soon be discontinued just as many other useless things have been eliminated from our technic. Ether should be used when the skin seems oily, and finally alcohol, to harden the skin and close the pores.

The average patient fears the operation much less than he does the anæsthetic, and it is very helpful to be able to say to him that the person who will administer his anæsthetic has had a large experience and gives it so that the patient does not suffer and is certain to regain consciousness. Every operating room should have an experienced anæsthetist, because it adds to the patient's comfort and safety, and allows the surgeon to give his undivided attention to the operation. No one thing has added more to my comfort and success than my trusted anæsthetist, who has served me faithfully for several years. Many patients have lost their lives because the anæsthetic was so poorly administered that technical mistakes were made while he was being resuscitated.

There are many things pertaining to the operation itself which have a decided bearing on the after treatment. Careless and rough handling of the patient while he is unconscious is a common cause of discomfort and pain afterward. While unseemly haste in an operation is to be deprecated, we should not keep the patient lying on an iron table and inhaling the anæsthetic any longer than is absolutely necessary, because the former causes backaches, and the latter is conducive to bronchitis, pneumonia and nephritis. There is no doubt but that the hard operating table is the cause of much discomfort during convalescence, and clean pads and cushions, well covered with sterile sheets, should be placed between the patient and the table. A

[1] Read before the Western Surgical Association.

groove running lengthwise in the table prevents undue pressure upon the spinous processes, and saves subsequent suffering from that source. The severe post-operative backache as commonly complained of is due to the bruising by the hard table, and to the spraining of the muscles of the back from a faulty position maintained for a long time. The spraining can be prevented by placing a pad under the small of the back during the operation, so that the natural forward curve of the spine in the lumbar region can not sag. In our Northern climate, no operating table should be without a heating device for cold weather. The electric is the most elegant and convenient, but a hot water tank or coil is equally efficient. Our tables all provide for drainage now, and we should see that the drainage is not so interfered with that the patient lies in a puddle of water during the operation.

The patient always thinks the stitches and bandages are too tight, and it is very important that the surgeon should know that they are not so. Most stitch abscesses are caused by tight sutures, and tight bandages have been the cause of untold suffering.

Thirst is the greatest source of suffering after operation, and in the management of this symptom many mistakes are made. A few years ago nurses were taught that patients should not have water after abdominal operations, and they gradually extended that prohibition to all who had recently taken an anæsthetic. Unfortunately for suffering humanity, this teaching still prevails in many hospitals. This is a piece of barbarism equal to that of our forefathers, who allowed their typhoid fever patients to die from thirst. My patients all get water after operation, and they convalesce much more comfortably than those who are deprived of it. Even after stomach operations, with our modern technic, patients suffer so little from vomiting that water can be given in moderate quantities by the mouth from the very first, so that, with the aid of salt water enemata, they need not suffer from thirst. Patients are deprived of water on the theory that the water causes vomiting. A certain percentage of patients will vomit after an anæsthetic, no matter what anæsthetic is used or by whom administered, and depriving them of water will not prevent it and does add to their suffering. I once had occasion to take an anæsthetic myself and naturally had a raging thirst soon after. Following a heated controversy with my nurse I drank a glass of beer. I must admit that it tasted better going down than coming up, but it did me good both ways, for it took the edge off my thirst, and washed out my stomach, which stopped my vomiting. A full glass of water given to a patient will frequently stop his vomiting by a process of natural lavage, and with much less discomfort than would be caused by passing a stomach tube. In a case of persistent vomiting nothing is so efficient as lavage, but it is always trying, and a disagreeable ordeal for both patient and attendant. Any vomiting that might be caused by a drink of water will do no harm, for with our modern hæmostasis and wound closing, we need have no fear of secondary hemorrhage or the wound opening. The only possible objection is that the act of vomiting causes pain, but if left to the patient he will choose the water every time, for the water is grateful to him, and it is much less painful to vomit when there is water in the stomach than when it is empty.

All surgeons agree that the patient is better without food for a time after operation, for he does not suffer from hunger and an effort to force feeding would surely disturb his stomach. Definite rules as to the time of feeding and the character of the food can not be satisfactorily formulated. The patient's appetite and taste are the best criteria. He does not crave substantial food at first, but as soon as he does crave it he should have it. Many a patient has gotten out of bed wabbly on his legs, at a time when he should have been strong, simply because he has been fed on slops. One who had not undergone an operation would wabble under like conditions.

Aside from opiates and mild cathartics, medicine has very little place in post-operative treatment. My patients get it only to meet definite indications.

Pain is the one symptom common to all patients after an operation, and demands our constant consideration. As already suggested, much can be done in the way of prevention, but after that our sheet-anchor is opium in some of its various forms. Morphia administered hypodermatically is the universal favorite. Codia and other milder preparations are disappointing and should only be used where the patient is known to have a marked idiosyncrasy against morphia. When morphia is indicated, it should be given in full doses — usually one-fourth of a grain — because a smaller dose does not have the desired effect and is just as liable to be followed by unpleasant effects as a larger one. It is our mission on earth to relieve pain, and in post-operative treatment we have a great opportunity. One who denies his patients an opiate after an operation, on theoretical grounds, is in error, and would very quickly change his views were he the patient. At one time I, in common with most surgeons, denied my patients opiates after abdominal operations, on the theory that they caused gas and consequently greater suffering.

My patients differed from me at the time and censured me afterward, and after long experience I am thoroughly convinced that they were right. All patients have some discomfort from gas after the abdomen has been opened, but my patients have infinitely less suffering now than they did when I denied them this boon. Some able surgeons of large experience are now giving a hypodermic of morphia to these patients before they recover from the anæsthetic, as a routine, and while I have not yet adopted the routine, I am inclined to believe that this will eventually be the accepted practice. As long as the hypodermic syringe is kept in the hands of the nurse, and its use discontinued when the surgeon decides that it is no longer needed, any fears of establishing a habit are only theoretical. Post-anæsthetic vomiting is not a contra-indication for the hypodermic, but, on the contrary, it is often helpful in this condition.

The proper care of the bowels after an operation has much to do with the patient's comfort. In other than abdominal cases, the patient will feel better after a bowel movement on the second day, which can be secured by a glycerine enema or a wine-glass of Pluto water. In abdominal cases, where the intestines have not been involved in the operation, the same rule applies, but when the bowel has been operated upon, it is well to wait until the third or fourth day for fear of injury at the seat of operation. In one of my cases an over-zealous orderly administered a high enema on the day after an operation for suppurative appendicitis, with the result that part of the enema came out through the wound. When the patient is distended with gas, a Nobles enema should be given, and repeated if necessary. There should be no exceptions to this rule, because the danger from distention with gas is greater in any case than it would be from an enema, and this enema is the best known means of causing the expulsion of gas.

In the care of the bladder, the catheter should be used only as a last resort, and then with the utmost care. Hot applications and change of position, even to getting out of bed, will usually enable the patient to empty his bladder voluntarily.

In every case the question naturally arises, when shall the patient get out of bed? All agree that old people should get up at the very earliest period possible, for reasons well understood, but there is still a great diversity of opinion as to when a younger patient should get up. A few years ago we kept patients in bed longer than we do now, but we found that, instead of shortening convalesence, it lengthened it. The tendency now is for the pendulum to swing too far the other way, for many patients have had their convalescence unduly prolonged through efforts to get them out of bed too soon. It is not well to establish fixed rules in this matter. It is far better to allow each patient to be a law unto himself. With foolish patients, the surgeon must be arbitrary and settle the question in accordance with his judgment, but sensible patients can often be consulted in this matter to advantage. The average patient may be allowed to get up as soon as he can do so comfortably.

Every abdominal operation is of sufficient importance to justify the patient in remaining in bed for from one to three weeks, owing to circumstances, and he is usually content to do so. There is no crying need for getting a patient out of bed the day after an abdominal operation. He is safer and more comfortable in bed for a few days at least. I recently operated upon a colleague for chronic appendicitis, who made the statement that he intended to get out of bed the day after operation: that staying in bed for a week after such a simple operation was all nonsense, to all of which I readily acceded, with a mental reservation. On the first day he quietly curled up on his side, and I smiled without comment. On the second day he was still in bed, and when I asked him why he was not up, he mildly suggested that I go to a warmer climate, and very emphatically stated that his viewpoint had changed.

A NEW FORM OF SURGICAL ADHESIVE PLASTER[1]

By CHARLES LESTER LEONARD, A. M., M. D., Philadelphia

The firm fixation of aseptic gauze dressings has been a problem that has been solved in various ways. Their flexibility, while advantageous in their application, has decreased their value as fixation dressings. The application of ordinary adhesive plaster affects only the superficial layer and is cumbersome and in some cases unsightly.

These and other difficulties can be met by a new form of Janus or double-faced plaster which is now first introduced for this purpose in surgical procedure. This plaster has a double coating. On one side zinc oxide and on the other plain rubber adhesive. Thus the plaster can be applied directly to the skin and covered with a bandage or can be made to hold the initial end of the bandage in place. It can also be utilized to hold compresses and splints in place, insuring absolute fixation in their original position. Applied in strips between the layers of bandage it adheres to both, fixing them intimately together, preventing any displacement and increasing their rigidity, and consequently the support obtained for the parts. It is very serviceable, neat, and effective as a method of fixing the loose end of any bandage, a transverse strip, the width of the bandage in length, beneath the end holding it firmly and neatly in position, a very desirable result, especially in dressings on the head and face. Local dressings, as in boils, abscesses, or ulcers, can be held in place by strips concealed beneath the final layer of gauze.

Other applications of this form of surgical adhesive plaster will readily suggest themselves to the surgeon when employing it in practical work, where it will be found particularly useful in fixing dressings, pads, or splints to the skin, and in rendering dressing compact, firm, and neat.

Unknown to the author it has for some time been manufactured in sheets, seven by twelve inches in size, as Janus plaster by the J. Ellwood Lee Co., of Conshohocken, but it has not been utilized in surgical dressings or previously made in a form suitable for surgical application. Its only use has heretofore been in the retention of wigs and toupees.

They have at the author's suggestion now manufactured it in five-yard rolls, one inch, one-half and one-fourth inch wide, and can furnish it, if desired in sterile packages.

THE TREATMENT OF FIBROID TUMORS OF THE UTERUS COMPLICATED BY PREGNANCY[2]

By LEWIS S. McMURTRY, A.M., M.D., Louisville, Ky.
Professor of Gynecological and Abdominal Surgery in the Medical Dept. of Central University of Kentucky; Surgeon to the Louisville City Hospital, Female Division; etc., etc.

The surgical treatment of uterine fibromyomata has reached such a degree of perfection in the hands of accredited operators that further improvement must be limited to the special varieties and complications which are presented in this very common class of neoplasms. It is the purpose of this paper to invite attention to one important phase of this subject, which, though considered by many writers briefly and with numerous clinical reports, has not as yet been placed upon the practical basis of uniform and accepted methods of treatment. I allude to the indications for surgical intervention in cases of fibromyomata complicating pregnancy, with especial reference to the time for such intervention and the plan and scope of the operative procedure in the varying conditions presented.

It is well known that uterine fibromyomata are very commonly associated with sterility. Veit estimates that 8 to 10 per cent of married women are sterile, but that quite 30 per cent of married women with uterine fibroids are sterile. Again, the period of greatest fecundity is before the age of 35 years, whereas the period at which uterine fibromyomata most frequently occur is after 35. And, moreover, so great are the conservative powers of the pregnant uterus that small tumors in any part of the uterus very rarely interfere with pregnancy and labor; comparatively large tumors in

[1] Read before the Philadelphia Academy of Surgery, December 2, 1907.

[2] Presented to the Southern Surgical and Gynecological Association in New Orleans, December 12, 1907.

the upper part of the uterus only exceptionally necessitate surgical intervention, and moderately large tumors, growing from the lower uterine segment and resting within the true pelvis, do not invariably prove insuperable obstacles to spontaneous delivery at term. From these facts it is an obvious deduction that uterine fibromyomata and pregnancy are only rarely associated, and that surgical intervention will only be necessary in a judiciously selected proportion of cases. In connection with the declaration that pregnancy and uterine fibromyomata are rarely associated, the fact must be considered that both pregnancy and uterine fibroids are very common conditions, and the expression "rarely associated" is to be taken relatively. Every surgeon engaged in gynecological work meets with this condition, and the aggregate of such cases is a large number.

Since fibromyomata are composed histologically of the same elements as the uterine wall they undergo in pregnancy the same change. The tumor, with the entire uterus, has an increased blood supply and active growth. Tumors so insignificant in size as never to have been observed, under the stimulus of pregnancy grow to appreciable proportions. Growths of moderate size become conspicuous and oppressive as pregnancy advances. The increased vascularity of the uterus begets softening of the tumor, and edema of the tumor is common. Hemorrhage into the tumor has been observed; cystic degeneration and necrosis are changes to which the tumor substance is liable during pregnancy. The growth of the tumor *pari passu* with the increase in size of the pregnant uterus accentuates early all the ordinary pressure symptoms of the adjacent viscera, especially as to the bladder and rectum. A subperitoneal fibromyoma which has become pedunculated has been observed with twisted pedicle and consequent necrosis as a result of the increased mobility incident to its ascent from the pelvis to the abdomen. This necrosis, as under normal conditions, is more common with submucous tumors, but may obtain in subserous and interstitial growths also. When the blood supply is reduced during the puerperium necrosis is more apt to occur. The tumor may so interfere with symmetrical contraction of the uterus that excessive and even fatal hemorrhage may arise from patency of the uterine sinuses after the placenta is detached.

During the course of pregnancy numerous abnormalities arise from the mechanical effects of the tumor. The uterine end of the Fallopian tube may be so obstructed by the growth that the ovum develops in the tube. In C. P. Noble's statistics, of 19 cases of fibroid tumors, associated with pregnancy, 6 were ectopic. When the cavity of the fundus is distorted by the growth, the ovum and placenta are often implanted low down, in some instances producing placenta previa. Veit states that instead of the head presenting in 95 per cent of the cases, as obtains in normal labors, in pregnancy associated with fibromyomata there are only 54 per cent of head presentations, with 28 per cent of breech presentations, and 19 per cent of transverse presentations, the labor being thus made more hazardous in consequence of the complication. Of course, the most serious effect exerted is the obstruction directly to the delivery of the child by the tumor or tumors filling partially or entirely the pelvic cavity. The pain resulting from the abnormal pressure during the latter months of pregnancy, and the moral influence exerted by the woman's knowledge that an abnormality exists, deserve mention in this connection.

It is apparent from these observations that the association of pregnancy with uterine fibromyomata adds very materially to the dangers of this condition; that new dangers will arise from the combination of the two; and while the clinical fact that a considerable proportion of the cases come through in safety is indisputable, the mortality of the entire number of cases left to nature is high. That statistical studies of such surgical subjects as this are misleading, and in great part unobtainable is well known. Fatal cases are rarely reported. The mortality of this condition, with existing statistics, is high, and if all cases treated non-surgically could be obtained, the showing would be discouraging indeed. The following extract from the report published by Esch of Olshausen's clinic will illustrate the results of obstetrical (non-surgical) and surgical treatment in three illustrative cases:

Case 1. The subserous myoma filled the greater part of the true pelvis and the pouch of Douglas. It was a foot presentation. After a labor lasting two days, the membranes having ruptured, the tumor had risen, rendering delivery possible. The baby succumbed on the sixth day to injuries sustained at birth, and the puerperium was complicated by thrombo-phlebitis with pulmonary embolism on the part of the mother.

Case 2. Eighteen months later the same mother was at term. The child presented by the occiput. By this time the pelvis was entirely occupied by the tumor. After 3 days of labor without results, a classical Cesarean section was performed. At the same time the myoma was removed from the posterior uterine wall. On the twenty-first day both mother and child were discharged in good condition.

Case 3. The pelvis being filled by subserous immovable myoma and labor having continued to 24 hours without results, Cesarean section with supravaginal amputation of the uterus was done. The child was saved and the mother made an uneventful recovery.*

*Zentralbl. f. Gyna., vol. xxx, 17, 1906.

I would call especial attention to the results of delay in the first two cases, and that operation was done in the third case after 24 hours of futile waiting on nature.

In further illustration of the advantage of prompt operative intervention in properly selected cases, I desire to offer the following cases from my personal experience:

Case 1. Mrs. T. M. J., of Vincennes, Indiana, age 32 years, was referred to me by her family physician on October 22, 1907. She was married in June of the present year, and had missed three menstrual periods. The signs and symptoms of pregnancy were manifest. Three weeks previously 2 indurated tumors were detected on each side of the lower abdomen, the tumor on the right side being larger than the one on the left side. The tumors grew rapidly, and were recognized as fibromyomata of the uterus by the family physician. On examination by the bimanual method it was apparent that the tumors were uterine, the one on the left side being more mobile than that on the opposite side. The tumors were growing from the lower segment of the uterus and were within the true pelvis. On October 25, 1907, I did abdominal section and removed both tumors by myomectomy. Both tumors were subserous; that on the left side of the uterus having a broad pedicle, while the one opposite was sessile. Both were readily removed after incising and separating the peritoneum at the base, and suturing with cat-gut arrested the hemorrhage, which was not great, thus completing this part of the operation. There were no other tumors, the uterus being quite normal otherwise. No uterine contraction followed the operation; convalescence was prompt and without untoward incident of any kind, and pregnancy has proceeded in a perfectly normal way up to the present time.

Case 2. (Abstract) Mrs. W. E. J., age 37 years, was referred to me by Dr. T. H. Garvin, of Horse Cave, Ky. The patient was supposed to be in the fifth month of pregnancy, and was very large. The pelvis was packed with an interstitial fibromyoma of the uterus. The cervix could barely be reached by the finger upon vaginal examination, having been carried up above the pubes. The symptoms of pregnancy were present. The patient was anæmic and emaciated, and had suffered for weeks with nausea and pressure symptoms. Abdominal section was done and the entire tumor removed by hystero-myomectomy. After the tumor was removed it was incised and the fetus appeared in the upper portion of the tumor mass. The convalescence was rather tedious on account of the patient's enfeebled condition, but she made a good recovery, and left the hospital quite well at the end of the fourth week.

Case 3. (Abstract) Mrs. T. E. W., of Louisville, Ky., was seen with her physician April 12, 1905. This patient was 28 years of age, had been married nine years; never pregnant until the present, having reached the eighth month of pregnancy, when she was delivered of a dead child. The placenta was retained, and when I was called septic symptoms had appeared. Efforts to remove the placenta had failed on account of the presence of the tumor, which was interstitial and occupied the lower portion of the pelvic cavity. Supra-vaginal hysterectomy was performed, and the patient made a good recovery.

Case 4. (Abstract) Caroline G., a mulatto woman, age 37 years, of New Albany, Indiana, was referred to me by her physician February 7, 1904. Patient had known for a year or more that she had an abdominal tumor, which had increased very rapidly since she missed her menstruation 6 months previous to the date I first saw her. Examination showed her to be in advanced pregnancy, with a large multinodular fibromyoma packing the pelvis. On April 5th she was admitted to the infirmary with the first pains of labor. The cervix was above the pubes and beyond reach of the finger. Under chloroform anæsthesia, I did abdominal section. The uterus was incised, a female child and placenta were delivered; the uterus contracted promptly. The entire tumor mass with uterus was removed by supravaginal hysterectomy, and the operation completed in the usual way. The mother had an uncomplicated convalescence, and left the infirmary with her child on May 2, which was 3 weeks and 4 days after operation.

I have selected these four cases as illustrating the multiform aspects of uterine fibromyomata, complicated by pregnancy as clinically presented. My entire experience consists of two more cases, in which operation was done in the early period of pregnancy, making 6 cases in all, and all recovered. This is not an exceptional experience, but is about the usual results of operative treatment in the hands of experienced surgeons.

My thesis is that, while indiscriminate operation in uterine fibromyomata associated with pregnancy is not to be advised, the mortality of this condition, when unaided, is so great as to justify an extension of the field of operative treatment, both as to myomectomy and hystero-myomectomy; and every case should receive individual consideration so that a judicious selection of cases for operation may be observed.

TUBERCULOSIS OF THE TONGUE, WITH REPORT OF A CASE[1]

By WM. M. HARSHA, M. D., Chicago

Mr. A. S., married, age 40 years, American, referred to me by Dr. W. D. Herriman; does light office work. Father died at 49 with paralysis. Mother died at 47, some time after operation for cancer of the breast, probably from recurrence in the lung or pleura. He has three brothers and three sisters, all in good health; one sister died in infancy. Personal history good; has had no diseases since those of childhood. Habits good, except smokes a pipe several times a day. Drinks little. Weighs about one hundred and thirty pounds.

HISTORY OF PRESENT TROUBLE

In March of 1907, he bit his tongue on right side, midway between base and tip, and consulted Dr. Herriman, who cauterized the wound with pure nitrate of silver. In six weeks the tongue was completely healed, when he again bit in the same place. Following this second injury, it was treated several times with a strong solution of nitrate of silver. In two or three weeks the swelling at the site of the injury increased, forming a nodule the size of a hazel-nut, which seemed to involve the deeper structures of the tongue. At the apex of this nodule, a small ulcer formed. The patient was then given specific treatment although there was no history of syphilis. The condition of the tongue remained stationary until August, 1907, when I first saw him. He appeared well nourished, and complained of nothing but the trouble with his tongue. The mass on the right border of the tongue was indurated; was not painful, but interfered slightly with phonation and with free movements of the tongue. It presented every appearance of epithelioma. There was slight enlargement of a cervical gland on the same side. No physical signs of tuberculosis were found except this enlarged cervical gland. There had been no improvement under specific treatment for several weeks.

The age, history of cancer in the mother, absence of any appearance of tuberculosis or syphilis about the patient all made for diagnosis of epithelioma.

A piece was cut out with scissors and submitted to Dr. Jean Cooke, who reported negative as to epithelioma, and made no diagnosis. It was treated for some weeks expectantly, and following the partial excision for diagnosis, the swelling decreased to half its former size, and the ulceration almost disappeared.

In the early part of November, a small ulcer appeared, half way between the nodule and the tip of the tongue, and in a week, another at the tip; these were both on the under side of the border.

I now made a provisional diagnosis of tuberculosis, which was confirmed by Dr. Cooke, from sections taken from the border of the ulcer. Tubercle bacilli were now found in the saliva and throat secretions.

Dr. Cooke's report is as follows:

"Tissue removed from the tongue, December 2, 1907, Mr. A. S. (for Dr. Harsha). Fixing agent — Formalin, Imbedded — Paraffin, Stain — Hematoxylin and Eosin.

"Sections were made from the growth, cut parallel with the mucous membrane surface of the tongue: The epithelial layer is intact, except in one place, which shows the picture of an ulcer. At this area in the section, and in other places in the tissue, are seen tubercles. The center shows very slight tendency to the formation of a necrotic area. This area is surrounded by a zone of lymphatic cells, in which are found giant cells; outside of this is a reticular zone. Sections were stained for tubercle bacilli, and none were found. Three examinations of the sputum were made, and each time scattering tubercle bacilli were found."

December 7, 1907. The nodule and the two ulcers were freely excised. Hemorrhage was controlled with deep sutures. The wounds were well dried, and dressed with sub-gallate of bismuth, which was continued as a dressing. Healing was prompt and complete. The tongue now appears entirely well, and the patient has regained four or five pounds, lost prior to operation, and feels entirely well, although a few tubercle bacilli are still found in the throat and mouth secretions. He is on tuberculin treatment.

Tuberculosis of the tongue is so uncommon that there is great probability of a mistake in diagnosis in certain forms of the disease. When found without other evidence of tubercular disease, there is greater tendency to error. A majority of the cases reported have occurred secondary to well-marked tubercular disease.

In Il Policlinico, March, 1907, Della Vedova has reviewed the literature. He quotes Fischer, who found 6 cases in 1,500 of general tuberculosis, and Willigk, 2 in 1,317 cases. It may be secondary to tubercular lesions anywhere about the body; but

[1] Read before the Chicago Surgical Society, January 8, 1908. See discussion.

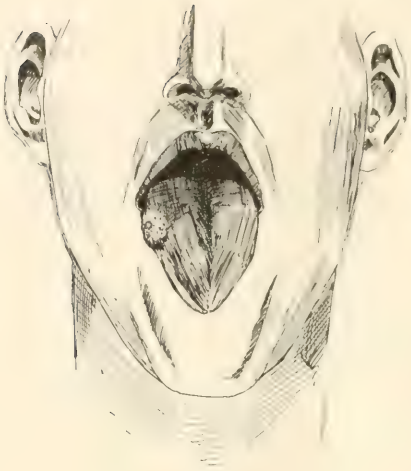


Fig. 1. Showing nodule.

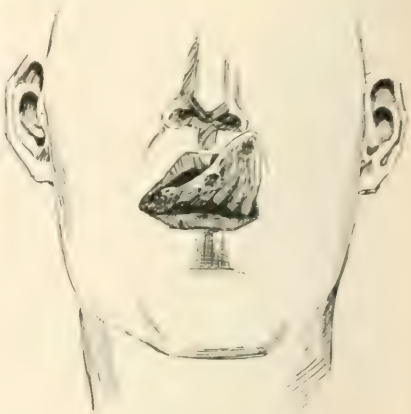


Fig. 2. Showing ulcers formed later.

few reported cases are considered primary. Schiferowitch pronounced 2 of 7 cases observed at Heidelberg clinic, primary, and Hopstein 1 case in 12, from the archives of the Hospital of St. John, of Bonn. These cases are quoted in the article above.

When it is remembered that more than one half of the bodies that come to autopsy show evidence of tubercuiar disease, the difficulty of pronouncing the case primary is evident.

The disease is more frequent in males than females; probably due to habits of smoking and drinking. It may occur at any age, but seems to occur more frequently between the ages of 40 and 50.

In the case reported here traumatism was the exciting cause of the first nodular lesion.

The location in this case, on the margin, and secondarily, beneath the border at the side and tip, is fairly typical, although the lesion may appear on the dorsum.

Also, the primary nodule and the secondary ulcers are characteristic of the two most frequent forms.

The diagnosis is most important, owing to the fact that it has been so frequently mistaken for epithelioma, and unnecessary mutilation of the tongue has resulted. (Warren. Surg. Path. & Ther. 1900,) says Volkmann twice operated for cancer in this disease.

Della Vedova, in the article before mentioned, cites from the literature 23 other cases operated under a mistaken diagnosis, by Bull, Albert Korte, and other well-known surgeons. In most of these cases, extensive operations were done and in some the tongue was entirely removed.

The ulcerating form, especially if multiple, should not be mistaken for epithelioma because of the shallowness and lack of deep induration. The nodular form, with or without slight ulceration, in the absence of other evidence of tubercular disease, can not be diagnosed without a microscopic examination. The clinical course is also important in reaching a correct diagnosis.

The growth may remain stationary longer than an epithelioma is likely to do.

It is most important to differentiate from Epithelioma Syphilis (Chancre or Gumma) and simple ulcer; less frequently, from Actinomycosis, Ulcerating Sarcoma, Adenoma or Acc. Thyroid, and other benign growths.

The lesion, untreated, is considered in some text-books (Am. Text Book of Surg., and Tillman's) as malignant as carcinoma, death usually occurring in from a few months to two years.

BIBLIOGRAPHY

Della Vedova. Il Polyclinico. March, 1907. Tuberculosis of the Tongue.

Cestan, R. and Baudet. Toulouse Med. '07. 2 s., p. 56–60. Tuberculosis of the Tongue, etc.

Caussade, G. Bull. et Mem. Soc. Med. d. Hop. d. Par. '04. 3 s. xxi, 1256. Tubercular Ulcer of the Tongue in a Tabetic.
Willie, A. and Wingrave, W. Med. Press and Circ. London, '06. n. s. lxxxii, 639. Two Cases of Tuberculosis of the Tongue.
Campbell, J. T. Laryngoscope St. Louis, '07, xvii, 233. A case of Tuberculous Ulcer of the Tongue.
Provera, C. Morgagni, Milano, '06, xlviii, 27. A Case of Primary Tuberculosis of the Tongue.
Renter – Militär – Arzt. Vienna, '06, xl, 110. Tuberculosis of the Base of the Tongue, Soft Palate, Pharynx and Larynx.
Morestin, H. Bull. et Mem. Soc. Anat. d. Paris. '06, lxxxi, 451. Tubercular Glossitis.
Finder. Berl. klin. Woch. '04, xli, 716. Demonstration of Cases of Secondary Tuberc. of the Tongue.
François. Danville Bull. et Mem. Soc. Anat. d. Par. '04, lxxix, 224. Verrucous Tuberculosis of the Tongue.
Danlos. Bull. Soc. France d. Derm. et Syph. Par. '03, xiv, 138. Tubercular Gumma of the Tongue.
Danlos. Same, p. 232.
Lepscher, S. Orr. gege – es fülogogy, Budapest, '03, 13. Tubercular Tumor at the Root of the Tongue.
Dally, J. F. H. Brit. Med. J., '03, ii, p. 1463. Tub. of Tongue.

A CASE OF INTERSCAPULOTHORACIC AMPUTATION FOR SARCOMA OF THE ARM

By EDWIN M. HASBROUCK, M. D., Washington, D. C.
Assistant Surgeon. Georgetown University Hospital

Removal of a leg, a thigh, or an arm is of daily occurrence and merits mention only when complicated in some unusual way, but the interscapulothoracic amputation — removal of the entire upper extremity — while it is a well-recognized surgical procedure and has been done many times, is still a very rare operation. That I cannot report a brilliant ultimate result is a lasting regret to all who watched the case through its early days of good promise,— but cerebral embolism is a thing that has to be reckoned with sooner or later, and in my case carried off final honors.

The chief indication for the interscapulothoracic amputation is malignant disease of the humerus, or in or about the shoulder joint; and as malignant disease of an extremity invariably necessitates amputation, the rule is to amputate above the neighboring joint, in order to get as far away as possible from the seat of disease and probably affected tissues. White asserts that surgeons at the present day are entirely justified in adopting this method in all such cases.

Statistics show that the average duration of life following the operation is three years. Jeanbrau and Richè have secured records of 24 cases alive after five years and 1 after twenty-six years. Forty-six and two-thirds per cent are reported as non-recurring at the end of one year, but this is, of course, entirely too short a time upon which to base any sort of an estimate, and 8⅓ per cent, according to Cobb, is the ratio when carried a little further.

In view of this enormous percentage of final fatal results — 91⅔ per cent — it would seem the part of wisdom to be a little more radical, and extend the method to all malignant disease existing above the elbow. If now there is virtue in going above the neighboring joint, by so doing we most certainly can get further away from the focus of disease, and, in the writer's opinion, the operation is attended with little more risk to the patient than is a shoulder-joint amputation and is scarcely more difficult to perform.

The operation is a formidable one, but the mortality is peculiarly low. Schultz gives 19.23 per cent before 1875, but this includes the cases before the dawn of either asepsis or anæsthesia. Since then and up to 1896 he gives 13.04 per cent. Berger, who gave us the perfected operation and whose method is generally followed, gives 5 per cent, and Fowler, writing in 1900, gives eight deaths out of 72 cases, a death rate of 11.1 per cent. Konitzer collected 24 cases from 1890 to 1899, with one death, a mortality of 4 per cent., while Douglas, in 1906, affirms that there have been in all 153 cases since 1887 with twelve deaths, a rate of 7.84 per cent, and, excluding certain unfavorable cases, 5 per cent. The present mortality is about 6 per cent, and should not go over 10 per cent.

The oldest case of record is 70 years of age, the youngest 10.

My own case is as follows:

Sallie C., colored, married, aged 65, mother of five children. Family history practically negative. Her parents lived to middle age, her mother not being in good health, from cause unknown. The patient herself had always been in the best of health with the exception of her tumor. About the age of 25 she noticed a small lump about the size of the end of her thumb on the inner aspect of the right arm at the bend of the elbow, that remained for a number of years about as it first appeared, without

Author's case of interscapulothoracic amputation.

causing any inconvenience. No cause can be assigned for its occurrence. Five years ago it "arose and burst," as she describes it, and two more lumps appeared, one after the other. Since then they have been growing larger. Last fall they began growing quite rapidly and became cauliflower-like and very painful, the pain gradually increasing in severity.

She had long refused all efforts to induce her to have the arm removed, but at last was willing to be relieved in any way that seemed best, and was referred to me by her family physician.

S. P. A strongly built, well-nourished, but anemic woman. On the right arm on the inner and posterior aspect is an ulcerated, suppurating, cauliflower tumor-mass, divided into three separate bunches, extending from the middle of the arm to the middle of the forearm. The mass bleeds easily and has a typical odor. The hand and wrist are badly swollen, but above the tumor-mass the arm does not appear to be involved. One small axillary gland can be felt, the size of an almond.

A small piece was excised from the tumor and submitted to Dr. J. B. Nichols for examination; the pathological report being "Large round-cell sarcoma."

The interscapulothoracic amputation was decided upon because of the malignancy of the growth, and because it was deemed best to keep as far away as possible from the seat of disease in securing flaps.

TECHNIQUE OF OPERATION

The first incision was made from the acromion to the insertion of the sterno-mastoid muscle, and the periosteum of the clavicle with its muscular attachments was dissected off; the clavicle was next divided with a Gigli saw at the junction of the middle and inner third. After freeing it from all attachments it was grasped with heavy forceps and forcibly twisted back and removed from its union with the scapula. The subclavian artery and vein were next exposed by a careful dissection and separated. Two heavy silk ligatures were placed on the artery and tied, and the artery cut between them. An additional ligature was placed on the proximal end for safety, as the vessel seemed very friable. The arm was then elevated to allow it to empty itself, and the vein was tied and cut between ligatures. A second incision was now made from the acromial end of the first incision around the shoulder, across the axilla, and terminating at the lower angle of the scapula, and the tissues divided. The big nerve trunks of the brachial plexus were injected with a few drops of a one per cent solution of cocaine before division, after the method of Crile and Cushing, and divided at the point of injection, and the axillary gland and tissues were removed. A third incision was now carried from the junction of the first and second over the acromion, down over the dorsum of the scapula, and meeting the second at the lower angle. The scapula with its muscular attachments was quickly dissected out, bleeding points ligated, a hot compress stopped all oozing, and the wound was closed with interrupted silk-worm gut, with a rubber tissue drain in the lower angle. There was absolutely no shock, and no loss of blood, save a little remaining in the removed extremity, and the patient left the table in excellent condition. Time, one hour ten minutes.

The drain was removed on the third day, and recovery was uneventful up to the seventh day, the patient sitting up on the sixth. She was the life of the ward, laughed and joked with everybody, and kept the other patients in a continual state of good humor. On the seventh day she went into a profound stupor, at first not clearly understood, but soon recognized as due to cerebral embolism. On July 4th, the third day of stupor, the condition was much improved, she smiled and talked a little. On the 11th the conditions were much worse, face drawn, involuntary stools and urination; limbs responded slowly or not at all to irritation; she took nourishment, but could not talk. On the 12th the temperature suddenly rose to 108.6 and as quickly dropped again, showing that the heat centers were involved, as there was no corresponding rise in either pulse or respiration. She died July 15th, three weeks from day of operation.

The part of the operation requiring the greatest care was the ligating of the subclavian artery and vein before removing the arm and shoulder. One had to work cautiously and slowly; but with the clavicle out of the way, I was much impressed with the ease with which it was accomplished, and the

fact that the operation is much facilitated by the absence of diseased tissues in the region of the neck.

Death from this operation will be due to shock either accompanied by hemorrhage or without it, and therein lie the two important points to be observed: — the control of hemorrhage and the prevention of shock from division of the great nerve trunks. In my case it was very clearly shown that shock could be prevented by absolutely controlling hemorrhage so that practically no blood was lost, and by the adoption of the Crile-Cushing method of injecting a weak solution of cocaine into the large trunks of the brachial plexus before division. That the division of these large trunks — the brachial plexus, sciatic and anterior crural nerves — is one of the greatest factors in contributing to surgical shock, is almost too well known to require mention. Crile, who has done much work along this line both experimentally and in practical work, has shown that the injection of a few drops of a weak solution of cocaine directly into the nerve trunk before division completely eliminates this factor. Cushing has reported 2 cases of interscapulothoracic amputation, and Lund and Farrar Cobb each 1, in which this method was used with perfect success.

The control of hemorrhage is probably the most important factor, and the third portion of the subclavian artery and vein should be exposed by the method that promises the greatest safety. The method of resecting the clavicle at its inner third was chosen, because no good reason was seen for adopting the more dangerous one of disarticulation at the sternal joint, in which one would risk wounding the innominate vein or the pleura; while, had the operation been on the left side, there would have been, in addition, danger to the thoracic duct at its junction with the subclavian and internal jugular.

The operation as detailed is essentially that perfected by Berger and published in 1887.

REPORT OF A CASE OF DEGENERATED UTERINE MYOMA[1]

By E. A. VANDER VEER, M. D.
Attending Surgeon, Albany Hospital

I wish to report the following case, the particular point of interest being the pathological findings.

The history of the patient is as follows:

Mrs. J. E. Born in United States. Age, 53; married. Housewife by occupation. Entered the Albany Hospital complaining of a growth in the lower part of the abdomen.

Family History. Maternal grandmother died of cancer of the stomach. No history of tuberculosis in the family. Family history otherwise negative.

Past History. Was sick at the menopause, dropsy setting in at that time, and legs and feet were badly swollen, but have not been swollen for three years.

Present Illness. Four years ago began to notice that abdomen was enlarging. The growth has been steady and gradual up to the present time. She has some pain low down in the abdomen, which patient attributes to weight of tumor. The inconvenience and unsightliness of it are the principal complaint of the patient.

Habits. Appetite good. Bowels very constipated. Sleeps well. Menstruation ceased three years ago and has never flowed since. Two children alive, one 29, other 22. Miscarriage 14 years ago, 4 months along.

Unfortunately the patient was not measured around the waist before the operation. The photograph, however, gives a good idea of her size. On physical examination the abdomen presents a tumor mass of twice the size of a four months pregnancy. Tumor fluctuates. Tympanitis in flanks.

On incision of abdomen, a thick-walled cyst presented itself without any adhesions. Trochar introduced and 18 pounds of fluid removed, one cyst not being opened. After this fluid had been removed, it was seen that the rest of the tumor was composed of myoma of the uterus. A suprapubic hysterectomy, with appendages, was then done. Patient lost but little blood. The appendix, very small, was not removed. The wound closed with silkworm-gut sutures. She left the table in good condition, rallied well from the operation, and made a good recovery.

The most interesting part of the case, which is the pathological report, is as follows:

Albany Hospital. Service of Dr. E. A. Vander Veer. Aged 53.

[1] Read before the Southern Surgical and Gynecological Association, New Orleans, December 12-14, 1905.

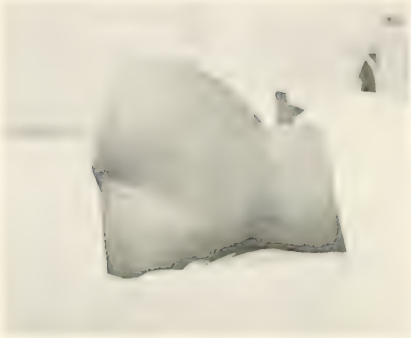


Fig. 1. Mrs. L. Cystic fibroma of the uterus. Fluid 18 pounds. Tumor 8 pounds.

Clinical Diagnosis. Ovarian cyst.

Organ or Tissue. Uterus, tubes, and ovaries.

Remarks. Has had four children, two were twins, two of the four still living. Had a miscarriage 14 years ago. At 41, began having uterine trouble and during this period experienced alternate periods of good health and great debility, and sometimes the slightest move would cause the blood to come in streams — would pass clots as large as one's hand. About 6 years ago, for a period of 3 months, flowed violently, though discharge had hardly any color, just a yellowish cast. Began to enlarge 4 years ago, the enlargement during past year being particularly rapid. For past 3 years has not flowed except a slight bloody discoloration to discharge occasionally.

Specimen consists of a uterus and appendages, the uterus having been removed by supra-pubic hysterectomy. The peritoneum covering the body and about the appendages has numerous firm fibrous tags attached, the left tube and ovary being intimately adherent. The appendages are elongated but otherwise apparently normal. Below the origin of the right tube is an incised wound, measuring 3 cm. in length, from which at operation was removed 18 pounds of a dirty brownish fluid, in which were numerous pieces of brown friable material, resembling blood clot. The uterus measures 28.5 x 28 x 8 cm. It is soft and flabby, and has been sectioned posteriorly. This incision opens into a larger cavity, the wall of which measures 3 cm. in thickness and the individual fibres of which are visible and distinct. This cavity is smooth, except over the anterior wall where it is thrown into numerous folds, and in part is irregular, due to a fluctuating mass about the size of an orange. The lining surface is covered by a smooth, glistening, dark brown membrane, which at the border of the corrugated area presents a reduplication. Distributed through it are yellow areas, containing cholesterin crystals. On section the mass is found to be made up of a series of cavities, filled with a yellow serous fluid. Between these cavities the supporting framework is composed of dense, yellow, fibrous tissue. To the right and posteriorly of the large cavity is a smaller cavity, which will admit an adult hand. This cavity extends toward the origin of the right tube and is of irregular outline. The lining surface is pinkish gray, and covered by a yellow sand-like material. Between the origin of the ovarian ligament and Fallopian tube is a fluctuating mass, measuring

Fig. 2. Tumor unopened.

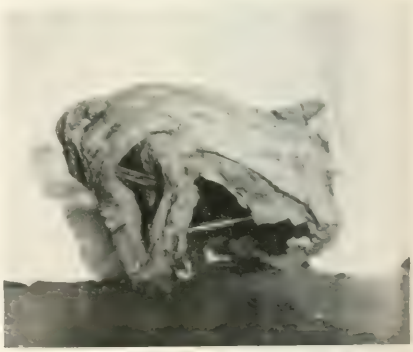


Fig. 3. Photograph [illegible] after [illegible]

4.5 x 2.5 x 3 cm., which on section is found to be made up of a series of cavities which are filled with a pale, yellowish brown, gelatinous material, about which the tissue is soft and grayish yellow and friable.

Anatomical Diagnosis. Chronic pelvic peritonitis. Multiple fibro-myomata of uterus with cystic transformation.

Microscopic Description. 1. Small cavity. The lining surface is covered by a layer of necrotic material. Beneath it there is a marked proliferation of young connective tissue, with fibrous transformation. Occasional plasma cells and polynuclears are present. The blood vessels are engorged and dilated. The intra-muscular connective tissue contains numerous areas of small round epithelial cells.

2. Large cavity. The lining surface is composed of edematous connective tissue, the superficial portion of which is composed of small round and epithelioid cells, between which is very little intercellular substance. The deeper portion is less cellular, containing considerable fibrillar intercellular substance. In the tissue beneath the lining surface is a small amount of old blood pigment. The intra-muscular connective tissue is irregularly increased and many of the blood-vessels are thickened.

3. Subperitoneal tumor. Irregular edema is present throughout; also area of necrosis. The greater part is composed of densely packed cells, having no definite outline or arrangement. The nuclei are of regular size and shape. Within the cellular tissue are a few areas of smooth muscle, showing hyaline degeneration. Adjacent to the cellular tissue, and extending into it, is considerable fibrous tissue in which are a few bundles of smooth muscle. A small portion of peritoneum is present.

Microscopic Diagnosis. Multiple myomata of uterus. Cyst of uterus resulting from degeneration of large myoma. Compression and obliteration of uterine cavity, with degeneration and destruction of mucosa.

STAB WOUND OF FETUS IN UTERO

Report of a Case of Stab Wound of Fetus in Utero, at Six and One-half Months, Penetrating Lateral Aspect of Abdominal Wall of Left Side, Completely Severing Jejunum. Escape of Large and Small Intestines Through Wound. Fetus Delivered at Term. Normal in All Other Respects. Operation. Autopsy

By D. A. K. STEELE, M. D., LL.D., Chicago
Senior Professor Surgery College of Physicians and Surgeons.

Mr. President and Members of the Chicago Surgical Society:

The history of the case that I will present for your consideration to-night, and the specimen submitted for examination, seem to be unique in the annals of surgical literature, and merit preservation in the archives of our society.

The following is the history:

September 15, 1907, Mrs. Mary M., aged 19, married three years, mother of one child, aged 22 months, in a fit of anger stabbed herself with a knife in the right side of the abdomen, four inches to the right and one and one-half inches below the umbilicus. At this date she was six and one-half months pregnant. She was taken to St. Elizabeth's Hospital and treated for one week, when the wound in her abdominal wall healed, and she returned home and has enjoyed good health since. She states that the surgeons at the hospital told her that the stab wound had probably not penetrated the uterus.

November 28, at 2 P.M., she was delivered by a midwife of a live male child, normal and fully developed, with the exception that, protruding from a wound in the lateral aspect of the abdominal wall of the left side, one and one-half inches above the anterior superior spinus process of the ileum, was a mass the size of a closed fist, which, on examination, was found to be the intestines. Dr. C. E. Brinkerhoff was called at 6 P.M., and notified me of the condition present. At my request the protruding bowels were wrapped in warm antiseptic gauze, the child enveloped in warm blankets, and was brought immediately to the Woman's Hospital for operation.

On examination a partially healed incised

Fig. 1.

1. Ileum. 2. Mesentary. 3. Distal blind pouch and contracted jejunum. 4. Proximal end of jejunum.

wound, one inch in length, at the point indicated, was demonstrated. Protruding through this wound, adherent to its margins, was the jejunum, the ileum, and all of the colon down to the sigmoid flexure. The upper portion of the jejunum was enormously dilated, being one and one-half inches in diameter. The lower portion of the jejunum, all of the ileum, and colon were coiled up in the adherent, contracted mass, the diameter of the ileum and colon being about one-eighth to one-fourth of an inch.

Maconium was found in the rectum. Many firm adhesions were found around the margins of the wound, which entirely closed the peritoneal cavity. A transverse incision across the abdominal wall, toward the median line from the stab wound, was carefully made, and the abdominal cavity entered with difficulty. It was found empty, except for the liver, spleen, pancreas and stomach, about four inches of duodenum, and two inches of the sigmoid flexure of the descending colon and rectum. All the rest of the gastro-intestinal tract lay outside the body, protruding through the stab wound — as shown in the photograph and drawings. The whole mass of intestines was agglutinated in folds of the mesentery and omentum, and a plastic exudate, which at first rendered the anatomical outline of the mass somewhat obscure.

Beginning at the pyloric end of the stomach, the duodenum and upper portion of the jejunum were separated, and traced down to a blunt extremity of the greatly dilated jejunum, about six inches below its juncture with the duodenum. The stomach contained about two and one-half ounces of bloody, viscid fluid, which was removed by catheterizing the œsophagus. A soft catheter introduced into the rectum, failed to pass through the mass of meconium, and met with obstruction after being introduced about one and one-half inches. Numerous adhesions, omental and fibrinous in character, were separated, the irregularities of the small intestines and colon were teased out as far as possible, and elevating the child by the heels and widely separating the edges of the wound, the entire mass was carefully restored to the abdominal cavity, the cavity filled with a warm normal salt solution, and the operation wound closed. No attempt at entero-anastomosis was made. The contracted, tortuous condition of the jejunum, ileum, and colon, had practically destroyed the patency of the lumen of the bowel, and rendered anastomosis impracticable. On account of the dense mass of adhesions around the divided bowel wall, I was unable, at this time, to recognize the fact that complete severance of the jejunum had occurred by the stab wound, and as the condition of the infant was so critical, and the result of any further operative intervention hopeless, nothing further was attempted.

The child reacted well, and survived the operation eight hours. Post mortem examination was made the next morning, at which time all the abdominal contents were removed. A further demonstration of the intestinal lesion showed that

the jejunum had been completely cut across by the stab wound penetrating the right abdominal wall of the mother, the right wall of the gravid uterus, and the left abdominal wall of the fetus in utero, completely severing the jejunum about six inches below its juncture with the duodenum.

The extraordinary feature of this case lies in the fact that a stab wound through the abdominal walls of the mother, penetrating the gravid uterus, entering the abdomen of the fetus in utero, completely severing the jejunum, and permitting the escape of the large and small intestines through the wound of the abdominal wall of the fetus — should not in any way have interfered with the growth and development of the fetus in utero, nor seriously affected the recovery of the mother.

Another interesting fact is the complete occlusion of the two divided ends of the intestine of the fetus, and the presence of nearly three ounces of glairy, sanguinoloid fluid in the stomach of the fetus at the time of operation — ten hours after birth. Unfortunately, this fluid was not preserved, so that I am unable to present a chemical analysis

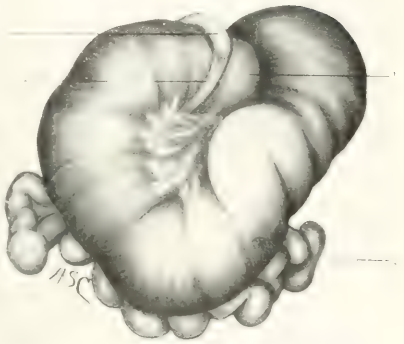


Fig. 3. Posterior view of intestine, showing blind pouch.

1. Proximal blind pouch of distended jejunum.
2. Contracted tortuous colon and small intestine.
3. Distal blind pouch, contracted jejunum.
4. Fibrous adhesions and plastic exudate.

Fig. 2.

1. Distal blind pouch and contracted jejunum.
2. Proximal blind pouch and distended jejunum.
3. Fibrous adhesions and plastic exudate.
4. Distended duodenum and upper part of jejunum.
5. Contracted ascending colon.
6. Contracted tortuous colon and small intestine.
7. Vermiform appendix.

of the fluid, or to throw any light on the problem discussed by our obstetrical friends, as to the nourishment of the fetus in utero by determining whether or not the fluid in the stomach was identical in its constituents with amniotic fluid.

In looking up the literature of the subject for me, my friend, Dr. William Fuller, finds a case reported by Beattie in the British Medical Journal, 1879, vol. i, page 1701, which in some respects resembles my case, although there was no reference to any injury or accident to the mother, and no autopsy was held to determine the cause of death. (Beattie reported the birth of a well developed child at term. The mother was a primipara, and the labor was in every way normal.)

"One and one-half inches below the umbilicus, and a little to the right of the median line, was a small opening in the abdominal wall of the child, which had permitted the escape of the whole of the colon and practically all of the small intestines, which were tightly constricted and presented a very contracted appearance. The opening was enlarged, the intestines replaced, and the wound was closed with silver wire sutures. The child reacted promptly from the operation, but died in thirty hours."

My friend, Dr. H. M. Richter, at my request, looked through the Index Catalogue, to ascertain if there were any similar cases recorded, and reports to me that Finnell reported a case of wound

of fetus in utero in the Buffalo Medical Journal, 1850, vol. xvi, page 475. Hoyt reported a case of wound in utero in the Boston Medical and Surgical Journal, 1844, vol. xxx, page 241; and Jones reported an extraordinary case of lesion within the uterus, with a partial reparation before birth, in the Medical and Chirurgical Transactions, London, 1847, vol. xxxii, pages 59-63. None of these cases in any way resembles the one reported to-night. And in addition to these references, a large number of papers on the general subject of intra-uterine injuries have been carefully investigated — references being made to the ordinary injuries from bands, etc.; so, from a careful inspection of the literature, the rarity of this case seems to be fully established.

I herewith present the post mortem specimen, and call your special attention to the enormous dilatation of the duodenum and upper few inches of the jejunum, the dilated portion terminating in a blind, blunt end of the jejunum, showing beautifully how nature had completely occluded the divided small intestine by a plastic exudate, which became completely organized.

You will observe, also, that the upper end of the contracted, tortuous jejunum, ileum, and colon is only from one-eighth to one-fourth of an inch in diameter, and the blunt end of the distal extremity is completely occluded in a similar manner, and lies obliquely across the distended proximal end, adherent by fibrinous exudate, but the continuity of the bowel completely destroyed at this point.

It is interesting to observe also that the proximal portion of the occluded bowel apparently has developed enormously, and contained some gastro-intestinal fluids, while the distal end became atrophic, convoluted, and shrunken, on account of the absence of any function; while the rectum and lower two inches of the sigmoid flexure, which remained within the child's abdomen, presented a more normal appearance, the rectum containing meconium, normal in appearance, but deficient in quantity. I direct your attention particularly to the appearance of the bowel above and below the point of division, because it is analogous to what we find when a nerve trunk or tendon is severed by an accidental wound, the proximal portion of these structures remaining normal, while the distal portion atrophies in a very marked degree within a few weeks, if nerve or tendon suture is not done.

In cases of arrested development of the gastro-intestinal tube, or in congenital absence of a portion of the intestine, we always find the lumen of the proximal and distal ends of the intestine of about the same diameter.

OVARIAN HERNIA, WITH A REPORT OF A CASE[1]

By RICHARD A. BOLT, A.B., M.D.
House Gynecologist, St. Vincent's Charity Hospital, Cleveland, Ohio

The comparative infrequency of hernia of the ovary makes the following case of more than usual interest. In a large and varied experience Howard Kelly has seen but two such cases, both of which were associated with congenital malformations.[1] Halsted, out of 27 cases of hernia in women, has come across but 2 in which the tube and ovary were involved in the hernial sac. Englisch, out of 38 collected cases of ovarian hernia, found that 27 were inguinal, 9 femoral, and 1 an obturator and ischiatic hernia.[2] Enterocele was found with 27 of a series of 67 cases, observed by Langton, mostly in children.[3] The literature on this subject has recently been reviewed by Dr. J. H. Carstens of Detroit, who found 117 reported cases, including two very interesting ones added by himself.[4] From the standpoint of diagnosis and uniqueness of treatment the following case merits some attention.

1. Operative Gynecology, by Howard A. Kelly. Vol. ii, p. 599.
2. Ibid. Vol. ii, p. 599.
3. Ibid. Vol. ii, p. 601.

Case. Mrs. K. B., aged 35 years. Nationality American. Married 14 years. Occupation, housework. Admitted to Charity Hospital September 25, 1907, with a provisional diagnosis of left inguinal hernia (ovarian). Patient has had 5 children. All are living in fair health. One miscarriage two years ago. Labors all difficult, the last delivery being with instruments. Perineum and cervix torn with first child. These were repaired four years ago.

Personal History. Patient complained of dragging pains in the small of the back, headaches, tired feeling, crampy-burning pain in the lower abdomen, and pain and swelling in the left groin. She has never been very strong.

One year ago patient noticed for the first time a small swelling in her left groin. This could be easily replaced, but came down again when patient was on feet working.

4. Jour. A. M. A., Nov. 2, 1907, p. 1512.

[1] A preliminary verbal report of this case was given by Dr. W. H. Humiston before the Cleveland Academy of Medicine at a meeting of the Clinical and Pathological Section, October 4, 1907.

"By spells" the tumor would seem to grow larger and then subside. Sometimes at the menstrual period it would be slightly larger and more painful. Very little trouble in reducing the hernia until lately. When difficult to replace, the patient claims she experienced "burning, sickening pains" which extended up from the left groin, and then across the abdomen to the other side.

Menstrual History. Menses began at 14 years. Never very regular. Flows 4 to 7 days. Pain and cramps at the first part of periods. Small clots passed at times. Last period August 20, 1907. Very slight leucorrheal discharge occasionally.

Present Condition. The patient was first seen in the Dispensary of Charity Hospital, September 21, 1907. She then complained of pain in the small of the back and across lower abdomen. This pain was described as "a burning, crampy pain," and seemed to be increased on pressure.

Vaginal examination revealed the following: The perineum was slightly relaxed, showing the scar of an old repaired laceration. Cervix of moderated size in the axis of the vagina. Old repaired bilateral laceration of cervix. Uterus firm, in normal anteflexion, and moderately movable. Ovary on the right side easily palpated, and apparently normal. Parametra on that side normal. On careful palpation over the left side no ovary could be felt; but when the external hand was placed in the left inguinal region the woman complained of pain. Examination there revealed a tumor about the size of a pigeon's egg, just above Poupart's ligament. It was slightly irregular, and had a firm, elastic feel. On coughing no expansile impulse could be obtained. With the left thigh flexed, the tumor could be rather easily reduced by gentle manipulation. The patient complained, however, of some sickening pain. The external abdominal ring readily admitted the tip of the index finger. When the patient strained, or coughed, while in the recumbent posture, the hernia did not easily come down. It reappeared, however, with such efforts, when the patient was upon her feet. A provisional diagnosis of inguinal ovarian hernia was given and the patient referred to Dr. W. H. Humiston. He carefully examined the woman and found practically the same points as noted before with the exception that he detected an ovoid body well out to the left side, and somewhat posterior to the uterus *when the hernia was reduced*. This, Dr. Humiston thought, was a slightly enlarged, prolapsed left ovary. The woman up to this time had never worn a truss as her family physician had said that it would be too uncomfortable, and do no good. It was not thought necessary to fit one at this time. The hernia was, therefore, reduced and the woman told to return for operation September 28th.

The woman claims that at 4 o'clock on the morning of September 25th, while straining at stool, a larger and firmer tumor appeared in the left groin than had ever been there before. It was firm and quite sensitive to the touch, especially at its lower end. The pain increased steadily, and was of a sickening, crampy nature when the woman attempted to replace the hernia. All efforts of patient and friends failed to reduce the hernia, and she was sent immediately to the hospital. It should be noted that the woman began to menstruate the same morning and continued to flow for 5 days after entering the hospital.

When seen shortly after noon September 25th, the patient complained of great pain in the left groin. On manipulating the hernia in an effort to reduce it, the pain seemed to be excruciating. An ovoid tumor, about the size of a large lemon, was seen in the left groin above Poupart's ligament. It was quite firm and slightly irregular at its lower pole; more elastic and fluxuating near the external abdominal ring. Several attempts were made to reduce the hernia, the patient crying all the while with pain. Finally the upper part suddenly slipped back with a gurgling sensation as though a tense bag of water had ruptured. After this was replaced, the firmer ovoid mass below it was easily reduced. A firm pad and bandage were then applied, the foot of the bed raised, and morphia gr. $\frac{1}{4}$ hypo. ordered. After this the woman became fairly comfortable. She took light nourishment. Had a little desire to vomit. Bowels were thoroughly moved in two days. Patient was in fair condition for operation on October 2nd.

Operation by Dr. W. H. Humiston. Ether anæsthesia. Trendelenburg position. An incision about 2 inches long was made at the outer border of the left rectus muscle. On opening the abdomen an excellent view of the pelvic viscera was obtained. The uterus was seen to be in anteflexion and slightly bent towards the left side. The left broad ligament was relaxed, and the appendages freely movable. The left ovary was sclero-cystic and in proximity to it was a parovarian cyst about the size of a small lemon. The fimbriated extremity of the tube together with ovary and parovarian cyst could easily be displaced into the internal inguinal ring. These structures had undoubtedly made up the contents of the hernial sac. The right tube and ovary were apparently normal. Appendix not inflamed. The intestines and omentum were entirely free, and showed no adhesions in the neighborhood of the left iliac fossa. On retracting the abdominal wall to the left, the left internal inguinal ring was easily seen with the peritoneal hernial sac puckered up about its edges. The index finger could readily be inserted into the inguinal canal.

The left tube and ovary, together with the parovarian cyst, were ligated off, and removed in the usual manner. With a very small round needle carrying fine silk thread, the edges of the internal inguinal ring were carefully drawn together *from within* by means of a continuous stitch. The abdomen was then closed with interrupted silkworm-gut sutures, the sutures being placed from within outwards, and catching a small portion of peritoneum, muscle, fascia, and skin. The edges of the skin were accurately approximated. A firm pad was applied over the external abdominal ring, and the ordinary dressings over the wound.

The woman made an uneventful recovery, and was up in about three weeks. The abdominal wound healed perfectly. No recurrence of the hernia. The woman returned a month after leaving the hospital, with an exacerbation of her old pulmonary trouble; but with no signs of hernia and no discomfort in the abdomen or pelvis.

PROF. DR. JACQUES L. REVERDIN

DEPARTMENT OF
NICHOLAS SENN FESTSCHRIFT

SOME REMARKS ON THE INTRAGLANDULAR ENUCLEATION OF GOITRE[1]

BY JACQUES L. REVERDIN, OF GENEVA, SWITZERLAND

IN the report on the surgical treatment of goitre that I was deputed to make to the twelfth session of the French Congress of Surgery in 1898, I showed the superiority of intraglandular enucleation, viewed either from the standpoint of mortality, or that of immediate or remote complications and, further, as to the cosmetic result.

I again take up this subject, for, on the one hand, some surgeons, most competent in the matter of goitre, consider partial thyroidectomy as the ideal operation, which does not seem to me to be justified; and, on the other hand, the new ideas that we owe to the physiologists on the functions of the thyroid and parathyroid glands furnish me with new arguments in favor of enucleation.

It was Porta, as we know, who first practiced, and that in 1840, intraglandular enucleation of tumors of the thyroid. This method was employed in some cases by Billroth, Wolff, and Bruns. In 1880, I myself enucleated solid tumors in two cases, deliberately planning the first, while in the second, having planned a unilateral thyroidectomy, and the tumor having been removed without ligation of the thyroid arteries, I perforce recognized that the ablation had been within the capsule of the gland.

The operation of Porta was adopted by many surgeons (Kottmann, Burckhardt) as the operation of choice for cysts, but to Socin of Basel belongs the merit of having recommended intraglandular enucleation for solid tumors, of having shown its advantages, studied its technic and, finally, of having demonstrated that it is practicable in a large proportion of cases of goitre.

To make plain the superiority of intraglandular enucleation over other operative methods and the reasons for this superiority, some words on the pathologic anatomy are indispensable; it is necessary also to be thoroughly clear as to the technic of the operation.

A very large proportion of goitres, at least in our country, are due to the development, at varying depths in the thickness of the gland, of single or multiple adenomata. We know that these neoplasms may develop in differ-

[1] Translated by Charles Adams, M. D., of Chicago.

ent ways, that they may continue growing as solid tumors preserving their benignant nature, may undergo transformation into malignant tumors (malignant adenomata or epitheliomata), or end in the form of liquid cysts.

The benign tumors, solid or liquid, are, it is hardly necessary to say, those only which are amenable to operation by enucleation; and what follows concerns them alone. These tumors in their growth present the peculiarity of isolating themselves from the neighboring tissues, and present the characteristics of what were formerly designated by the term "encysted tumors;" their mass, more or less voluminous, is clearly limited by a fibrous layer, sometimes, it is true, very thin, and separated from the adjacent parts by a layer of delicate cellular tissue which carries its nutrient vessels. In the case of a liquid cyst, the membrane has need of very little blood for its maintenance and receives few vessels from the surrounding parts; when, on the contrary, the adenoma remains solid, it requires a greater blood supply, and numerous arterioles enter it on its periphery.

So long as the tumor retains the characteristics of a benign neoplasm, be it cystic or solid, it remains clearly defined, distinct from the neighboring tissues and connected with them by a more or less dense, commonly quite delicate cellular tissue, easy to separate and carrying the blood-vessels. In short, it is encysted and more or less easily enucleable.

When multiple adenomata have originated in the same thyroid, although they increase in size, they always remain distinct and separated by a more or less thick layer of healthy glandular tissue, or they may lie close to each other and, in a way, touch, but they never fuse; they are always separated by a little connective tissue with their blood-vessels. It is not rare, in such cases, to find in groups or bunches little ovoid adenomata of the size of peas or small cherries that may be successively enucleated as one picks single grapes from a bunch. Frequently these little tumors are in proximity to a more voluminous one which has taken to itself most of the nutrient blood supply, not leaving sufficient for its little brothers, so that the enucleation of these small adenomata is often made with small loss of blood.

The size of encysted tumors of the thyroid is very variable. The largest are generally liquid, and such have been observed of the size of a head. Solid tumors rarely attain such dimensions, and most often, whether single or multiple, the whole mass will seldom exceed the size of an egg or that of a fist. Whether developing within the limits of the normal gland, in its prolongations or in accessory thyroids, a goodly number of retrosternal, retrovisceral and endothoracic goitres are adenomata.

In their gradual development thyroid adenomata tend more and more toward the anterior surface of the gland. This is easily understood, for posteriorly their extension is opposed by the trachea, œsophagus and spinal column. In general, they project laterally or anteriorly. When they become somewhat large, the peripheral parts of the gland become thinned, the compression exerted on them by the neoplasm interfering with their nutrition. As a re-

sult, the knife with which the capsule is incised comes quickly upon the adenoma.

In most cases the cellular tissue which unites the adenoma with its shell of gland tissue is delicate and easy to break up, the resistance of its vessels yielding readily to the finger. This holds good only in the absence of previous treatment, and not if some intervention have preceded the enucleation. Punctures, with or without injections in cystic tumors, or parenchymatous injections in solid growths, result in thickening and fibrous transformation of the capsule and its more or less intimate fusion with the tumor. Enucleation will then be in any case difficult and often impossible. In order that enucleation may be accomplished without hindrance, it is essential that the tumor shall not be torn, and it should be understood that inflammatory modifications and the adhesion of the tumor to the gland favor the occurrence of this accident.

This being established, what should be the technic of the operation of intraglandular enucleation?

The incision of choice is that of Kocher (Kragenschnitt), transverse and curved, with the convexity downward. It is, without doubt, that which leaves the most perfect cosmetic result; but we must be eclectic, and if the tumor be high in the gland, or very large, inasmuch as, in my opinion, the gland itself should not be luxated, this incision will be insufficient and we should use the oblique rectilinear or curved vertical incision, or, as the operation proceeds, we may extend one of the extremities of the Kragenschnitt upward. Safety should never be sacrificed for cosmetic results. Further, enucleation, for the reason that it does not involve luxation, does not require extensive exposure of the gland. The skin and the platysma being incised, the fascia in turn is divided vertically, as nearly as possible in the median line. Accordingly as the tumor projects in the median line or laterally, the muscles may be simply retracted or vertically incised, also as nearly as possible in the median line.

The cellular tissue still covering the gland should be completely divided, but with extreme precaution, as we perceive under this layer the vessels which run over the surface of the gland and may be easily torn. When the gland is well exposed, to an extent ordinarily of 3 to 4 centimeters, the operator seeks a space unoccupied by large vessels and incises the thyroid substance vertically, layer by layer, until the surface of the tumor is reached. Naturally, more or less severe hemorrhage is produced, but the gland once incised, it is easy to efficiently seize the vessels, compressing with them the glandular tissue, either after the incision has been made or during its progress, if that be necessary.

How do we know that the adenoma is exposed? Primarily by the difference in color, then by the fact that the neoplasm is separated from the enveloping gland structure by a layer of delicate connective tissue forming a plane of cleavage, and because the surface of the tumor is smooth and distinct from the thyroid tissue. As soon as the thyroid shell has been incised throughout its thickness, the edges of the incision with the divided vessels should be

seized with artery forceps. These effect hemostasis and will later serve as a guide for suturing.

We now proceed to the enucleation, which may be made with the director of Kocher or with the finger. For my part I prefer the finger, with which, even if gloved, one can feel perfectly what he is doing. The index finger is insinuated in the plane of cleavage and separates the tumor from its envelope, making its way little by little in the cellular interstice until the separation is complete and the adenoma is lifted from its bed.

As I have elsewhere said, I believe that it is ordinarily preferable to proceed in this operation in a rather leisurely manner, because by so doing the vessels which come from the thyroid envelope are stretched before being broken and the hemorrhage is therefore less; but it is needless to say that if, in spite of the precautions taken, hemorrhage is too profuse, one changes tactics and rapidly, but always prudently, terminates the enucleation in order to effect hemostasis.

There is besides a detail of technic which to me seems of great importance, the employment of which diminishes hemorrhage and greatly facilitates terminal hemostasis, *i. e.*, as the finger penetrates and separates the adhesions, the bleeding surfaces of the thyroid as they are freed, are successively seized with hemostatic forceps and drawn forward. At the moment that the tumor is lifted from its bed, the posterior wall of the cavity is seized with forceps and turned outward so that the whole of the internal surface is exposed to the view of the operator; this procedure makes hemostasis much more easy. The visible bleeding points being secured, the cavity, with forceps still in position, is packed with gauze, the opening closed, and compression being maintained for some minutes, the parenchymatous hemorrhage is thereby arrested or moderated. The tampon is then removed, and vessels still bleeding are seized in turn. The next step is the application of ligatures. This latter accomplished, a drain is placed in the cavity and the latter sutured. If it be small, it suffices to unite its edges; but if large, it should be obliterated by bringing its surfaces together by buried sutures of catgut. The muscles and fasciæ should also be sutured with catgut, and the skin reunited with silk-worm gut or the Michel clasps. The drain emerges through the line of sutures or through a counter-opening according to the requirements of the case.

In concluding this rather minute description I insist on the following points: In the first place, on the uselessness and danger of the luxation of the thyroid. It is useless, because it suffices to expose thoroughly a few centimeters of the gland for incision, and it is dangerous in needlessly aggravating traumatism and in exposing neighboring organs, particularly vessels and nerves, to lesions when accomplished with some difficulty. In the second place, I insist on relative slowness of operation, preferable in my opinion, during enucleation properly so called, and finally on the utility of placing forceps on the thyroid envelope successively during the progress of separation of the neoplasm.

If instead of a single adenoma we have to deal with a tumor made up of a greater or less number of nodules, the operation may present many variations.

Let us suppose, and such cases are not rare, that at the side of an adenoma of medium size there are many others as large as cherries or peas, it will often be possible to remove them through the primary incision if they are in contact, or by incising the internal surface of the thyroid tissue when they project, if they are simply neighbors. In other cases, after the enucleation of one tumor, it may be necessary to remove one or many through different incisions of the overlying gland. Cases have been observed in which as many as sixteen adenomata have been removed in this fashion from the same goitre. The very small adenomata scattered around a principal large tumor can be enucleated with the greatest ease and without any hemorrhage.

To avoid recurrence, it is always of prime importance to determine by close examination that no nodule be left behind. The operation will be somewhat prolonged, but its danger will not thereby be increased.

Let us now on the one hand consider the real or supposed disadvantages of enucleation, and on the other its advantages.

The two objections made to this method are: the loss of blood which it would occasion, and the greater frequency of recurrence to which the patient would be exposed. Have these objections any foundation, and to what extent?

HEMORRHAGE.

It is certain that extirpation, so perfectly methodized by Kocher, in whose operation the vessels are seized and ligated before being divided, is in experienced hands accompanied by very little bleeding; and on the other hand, enucleation, however well done, must perforce give rise to a loss of blood of which the amount depends more on the vascularity of the tumor than on the expertness of the operator, *i. e.*, the hemorrhage which takes place during the enucleation proper. It is needless to exaggerate the importance of this loss of blood. If we consult the figures of Bergeat, pupil of von Bruns, on the loss of blood during the enucleations and thyroidectomies of his master, we see that for enucleations he counts 71 per cent of the hemorrhages as insignificant, 20 per cent as notable, 7.4 per cent as profuse and 2.25 per cent as very profuse, and for the thyroidectomies respectively 78 per cent, 15.6 per cent, 4.2 per cent and 2.1 per cent. The difference is very slight and unimportant in that the very profuse or dangerous hemorrhages occur only in a slightly increased proportion (2.25 per cent to 2.1 per cent).

Some surgeons have endeavored to lessen the danger of hemorrhage during enucleation, by preventive hemostasis, by ligature of the base of the luxated thyroid with an elastic tube (Bose), by temporary compression of the arteries (Niehans), or by deligation (Roux). These procedures seem to me to have disadvantages which outweigh their single advantage, which is to save loss of blood. They do away with the primordial benefits of the operation of enucleation which are: to avoid all injury to the neighboring tissues and to con-

serve the vitality of the glandular covering. It seems to me that the latter would be compromised in grave fashion either by the elastic compression of the tumor, or by the constriction of the arteries by forceps or ligature. Furthermore, the procedure of Bose necessitates the luxation of the gland, which should be avoided as much as possible with the view of limiting the extent of the trauma.

Those tumors, however, enucleation of which might be dangerous on account of hemorrhage and which are not amenable to this operative method; those which are exceedingly vascular, those, in particular, which are pulsatile, should be removed by thyroidectomy, and on this point I maintain my conclusions of 1898: "It will be well to take into account the danger of hemorrhage and to prefer extirpation in very vascular tumors when this peculiarity can be recognized beforehand, or to change an enucleation already begun to another procedure, if one gets into difficulties with too much hemorrhage."

Again, it has been charged that enucleation is followed by secondary hemorrhages and the formation of hematomata which retard healing. One cannot see that enucleation should be more likely to be followed by secondary hemorrhages, which are due to faulty application of ligatures or to infection, than another method, and if secondary hemorrhages occur, the lack of care or expertness on the part of the operator should be blamed and not the method.

What is meant, I think, by the "alleged" hematomata, is the accumulation of blood in the cavity left in the gland by the continuation of an imperfectly arrested parenchymatous hemorrhage. As a matter of fact, one finds quite frequently at the first dressing a notable tumefaction of the region of the operation. This, I believe, is due in large measure to swelling of the thyroid tissue, but there is certainly sometimes added a collection or infiltration of blood which gives rise to the appearance, at the base of the neck, of an ecchymosis which may extend to the upper part of the chest.

But even in such cases I have not observed any serious trouble as a result of this condition, and the febrile reaction is of an aseptic character and is probably due to the simultaneous absorption of blood and the thyroid secretion.

I do not deny the occurrence, in certain cases, of these hematomata, but I do not consider this accident as in any way serious enough to influence the choice of operation.

RECURRENCE.

A more serious objection is that of danger of recurrence. It is not to be doubted that, in spite of all care, recurrences will be more frequent after enucleation than after thyroidectomy, all the more in that they may appear in both lobes, in the side operated on as well as in the other. Kocher and Brunner both affirm this greater frequency after their enucleations. These recurrences are of no importance except in those cases, the only ones examined, I think, wherein a second intervention became necessary. I cannot decide as

to their real frequency, as my experience is not sufficiently large to do so with authority. But supposing their number to be notably larger than that of recurrences after thyroidectomy, which also occur according to the same authors, I ask if the condition of the patient is not less disquieting after enucleation than after thyroidectomy.

The patient after enucleation may have a recurrence in the lobe operated upon or in the other. In the first case it will be possible without danger to enucleate the recurrent tumor or even to remove the lobe. In the other case the outlook is the same, enucleation or extirpation may be done without danger of thyroid insufficiency. The patient after thyroidectomy is not in the same condition, he has but one lobe and that is the seat of the tumor; we cannot remove it without grave danger, and shall be forced to enucleation or to resection, and the latter under conditions perhaps already dangerous. If we resect, we must be sure to leave enough of thyroid tissue, and what is left must be competent.

The danger of recurrence in the lobe not operated on seems to me the strongest argument against thyroidectomy when enucleation is possible. Enucleation provides for, while thyroidectomy may compromise, the future.

ADVANTAGES OF ENUCLEATION.

The advantages of enucleation correctly carried out in the cases to which it is suited are as follows:

1. Intraglandular enucleation shields from all lesions the neighboring organs, particularly the recurrent nerves.

2. It does not expose these organs to secondary lesions due to the process of cicatrization.

3. It preserves all normal gland tissue and assures, so far as possible, the continuance of function.

4. It should avoid suppression of the parathyroid glandules.

5. It makes later intervention on the untouched side possible, should such intervention become necessary.

6. It gives very good cosmetic results.

7. Its mortality is not greater than that of thyroidectomy.

I will elucidate these different points:

1. Intraglandular enucleation, well performed, shields from all lesions the neighboring organs, particularly the recurrent nerves. This advantage is indicated in some measure in the definition of enucleation, if it be done, as I believe is possible, in most cases without preliminary luxation of the gland. The glandular capsule is incised forward, and the work of separation of the nodule or nodules is accomplished entirely within the capsule, the neighboring organs never being in the path of the operator. Theoretically, then, no injury should be observed in these organs. It is not always so in reality, for Bergeat has observed two instances of paresis of the vocal chords in 179 enucleations by von Bruns and Bailly, one case in 58 enucleations by Socin. It is

difficult to explain the method of production of these pareses in the hands of such expert operators. In any case, their number is very much lower than the recorded 7 per cent in 900 operations by Kocher, the great majority of which were probably thyroidectomies. Is it not on account of the frequency of injury to the recurrent laryngeal nerves that this surgeon has modified his technic and respects that part of the gland overlying the nerves?

I would not insist on the injury of the superior laryngeal nerve which Wölfler thinks to be more frequent than is generally believed, and which according to him, through the medium of anæsthesia of the laryngeal mucosa, is one of the factors in the production of pneumonia by aspiration. It is clear that this nerve is out of reach during enucleation.

It is the same with the less frequent lesions of the trachea, the œsophagus and the pleura. Enucleation of retrovisceral goitres is not always possible, but when practicable, there can be no doubt that neighboring organs are beyond injury. I was convinced of this by a particularly difficult case of this kind wherein I was able, without complication or accident, to enucleate a voluminous tumor, a large adenoma, which distended both sides of the neck, while its middle part passed behind the œsophagus and larynx.

2. It does not expose neighboring organs to secondary lesions due to the process of cicatrization. Paralyses of the recurrents are not always immediate, they may not appear for some days after operation, and are then due to compression of the delicate fibres of the nerve by the tissue of repair. This is an additional reason for avoiding, if possible, all manipulation in the immediate vicinity of the nerve and consequently for executing the enucleation *in situ*, and without luxation. If paresis have been observed after enucleation, it is true very rarely, it has been perhaps because the gland has been displaced or because too rough or too rapid manipulations have indirectly affected the nerve by traction or contusion. It seems evident to me that enucleation, made calmly and gently without luxation, does away with the possibility of secondary injuries.

3. It preserves all normal gland tissue and assures, so far as possible, the continuance of function.

This advantage of enucleation is capital, and on this we must insist. Since the dangers consecutive to the total suppression of the thyroid gland have been recognized, the consequence has been for the surgeons that total thyroidectomy should be proscribed. They therefore replaced the latter partial thyroidectomy, but cases were observed in which operative myxedema followed this operation in spite of the preservation of a portion of the gland. Its appearance has been attributed to the small quantity, or to the lack of function, of the remaining part. Unfortunately we are not in possession, so far as I know, of any means of estimating the functional value of a thyroid and still less of that of any part of a diseased gland, nor the amount needful for the preservation of health. Although the physiologists have been able approximately to determine how much of the gland may with safety be

removed in certain species of animals, we have no precise method of application of their results to the human species, and above all in cases of goitre.

In his report to the twenty-third German Congress of Internal Medicine, Kocher stated that he had observed in his cases of operation for goitre, numbering 3000, 40 cases of cachexia strumipriva after total thyroidectomy, and 33, after partial thyroidectomy. The appearance of cachexia after partial thyroidectomy was, according to him, explained by the fact that in the earlier operations the operative technic had not reached the perfection of to-day, that one could not be certain that there was not aplasia of the opposite lobe, and that, in certain cases, suppuration had not destroyed the remaining portions of the gland. In 13 of these cases partial extirpation of both lobes had been practiced and the remainder of the gland had suffered from the intervention. Finally, he added, that according to his experience cachexia strumipriva is not so grave after partial, as after total thyroidectomy.

These explanations are of certainly valuable, but nevertheless the important fact remains that this surgeon, whose experience with goitre is peerless, has seen cachexia strumipriva following his partial thyroidectomies 33 times, while I know of only one case of this kind following enucleation.

We must not forget the observations made long ago by Sidney Jones regarding the diminution of the volume of the goitrous thyroid after section of the isthmus, nor the case of Poncet in which myxedema occurred after the resection of that isthmus. I believe, then, contrary to the opinion of Kocher, who thinks it would be a grave error to reject the operation of extirpation on the basis of these few unfavorable results, that they are sufficient reason for looking for something better, and that in all cases wherein it is possible, intraglandular enucleation is indicated. The preference given to thyroidectomy seems to me to be due to the more anatomical and orderly character of this method, to the fact that, the vessels being ligated before their section, it is less bloody in expert hands, but do these incontestable advantages outweigh the possible danger of cachexia, as rare as it may be? Certainly not.

Do we not see surgeons adopting the less anatomical procedures because of their better results, for example, abdominal prostatectomy, and furthermore, is it not the rule in operating upon an organ to limit, so far as possible, the mutilations in order to preserve the functions?

Functional troubles due to thyroid insufficiency are of such importance that we must do all that is possible for their avoidance.

From this point of view enucleation merits much more than thyroidectomy the qualification of the "ideal operation," but unfortunately it is not applicable to all cases. There are goitres which are amenable to enucleation, and others which are not, because the gland is wholly degenerated and the tumor is not due to the development of one or more than one nodules within the thyroid substance and separable from it.

We have not the data for solving the question as to what proportion of goitres may or may not be enucleable.

It is even probable, according to certain facts which have come to my knowledge, that the proportion will vary according to countries and regions. I think, however, that Socin was right when he wrote me: "I believe that many a surgeon will have the experience that I have had, that the enucleations increase with the inclination of the surgeon."

4. It should avoid the suppression of the parathyroid glandules. Only since a few years has the work of Mueller, Schaper, Schreiber, Chantemesse et Marie, Gley, Moussu, Jeandelyse and others thrown some light on the anatomy and the functions of these little organs, discovered by Sandstroem, but our knowledge on both points is still very incomplete.

We know that their number, their form, their volume, always very small, their situation and their relations with the thyroid vary markedly. Commonly there are two on each side. The external are situated on the posterior face of the lateral lobe, but at varying height, and are often solidly adherent to the fibrous capsule of the gland. Sometimes they are more or less distant and independent. The internal are, save in rare exceptions, included in the thyroid tissue. Tetany very likely is due to the suppression of the glandules, but we do not know what fractional part of them may be removed without danger of tetany. In experiments on animals this fractional part has been variable, and so far as man is concerned we are in total ignorance. We are no better informed as to the condition of the glandules when the thyroid is modified by goitre, and to my knowledge no research has been made upon this point in the infrequent autopsies which have followed operations for goitre. For these reasons I am unable to make positive statements. The subject calls for further investigation.

From the anatomical facts it is clear that the internal glandule must be sacrificed in all cases of thyroidectomy, and probably very often also the external, while enucleation should generally spare them, as it leaves intact the neighboring thyroid tissue, in the thickness of which they are found.

However, tetany has been observed, although with extreme rarity, following enucleation. I noted in my report of 1898, 2 cases of tetany in 1276 enucleations, *i. e.*, 0.07 per cent, the proportions being 3.64 per cent for total and 0.57 per cent for partial thyroidectomy. Kocher has observed 9 cases after total and 6 cases after partial thyroidectomy.

How is the occurrence of this complication after enucleation to be explained? Possibly it is due to too violent handling, or perhaps to the intimate relation of the removed tumor and the glandules. We must admit that at present we have only imperfect knowledge of these little organs and their special pathology. The fact remains, nevertheless, that if the suppression of their functions results in tetany, it is wise to employ operative methods which give the best chance for their preservation; and further, tetany has been frequently enough observed after partial thyroidectomy to make it a matter for consideration.

5. It makes later intervention on the untouched side possible, should such

intervention become necessary. J. Wolff long ago remarked that after thyroidectomy of one lobe, the other tended to diminish in volume, and although diseased at the time of operation, might atrophy to such an extent as to render further intervention useless. This observation has since been confirmed by a goodly number of surgeons who have studied this question, but it has also been observed that it is far from always being the case. In passing, we may say that atrophy of the side not operated on, of which we do not know the condition, may be a danger and may explain some of the cases of myxedema consecutive to partial thyroidectomy.

On the other hand, the untouched lobe instead of shrinking, particularly in the case of multiple adenoma, may enlarge to such a degree as to render a second operation necessary for the relief of compression. What can be done in such a case, if the first lobe have been entirely or almost entirely removed? Evidently we cannot, without exposing the patient to the risk of myxedema, remove the remaining lobe, for there would not be left a sufficient quantity of healthy thyroid tissue to insure function. We must, then, turn to a limited resection or to enucleation, when possible. Would it not have been better, at first, to have employed the method best calculated to preserve the glandular tissue? The patient would thus be exposed to infinitely less risk, and the surgeon to less anxiety. The glandular tissue saved in the first operation leaves to him the possibility of operating upon the second lobe, without the danger of myxedema, of making an enucleation if possible, or even of sacrificing if necessary a part of the second lobe. The situation would be entirely different, if the first lobe had been entirely or almost entirely removed.

In the cases of multiple and bilateral tumors, enucleation to my mind is the only rational procedure, and according to the conditions of the case, the surgeon can at one operation enucleate all the tumors from both lobes, or at first enucleate only those tumors which by their situation, size, or density are causing trouble, desisting to keep under observation those which remain, and holding himself ready to intervene afresh if it becomes necessary. In cases where recurrence is to be expected, enucleation provides for the future, while, as I have previously said, thyroidectomy may compromise it.

6. It gives very good cosmetic results. The idea that should always be kept in view by the surgeon is to plan operative methods in such fashion that form as well as function may be afterward found in as nearly as possible normal condition. Enucleation presents this superiority, in that it removes only the pathologic tissues forming the tumors and saves their envelope, which is nearly the same thing as the gland before their growth. As a result — apart from the cutaneous scar being insignificant — the neck, if the goitre have been unilateral, regains its normal form, and at the site of operation the deep structures are recovered by the thyroid cushion, which equalizes the contour. Such a perfect result seems to me to be incompatible with the partial or total removal of a lobe, which inevitably leaves a more or less marked depression. The results of thyroidectomy are certainly much superior to what they formerly were,

thanks to the perfection of technic, particularly in the cutaneous incision and that of the muscular layers, but in spite of all that, it cannot be claimed that it restores normal form when it takes away normal parts.

7. Its mortality is not greater than that of thyroidectomy. In my report of 1898, I gave statistics based upon 3408 operations for goitre. This number constitutes the total of the integral statistics very obligingly communicated to me by their authors, surgeons of all nationalities. Partial extirpation figures in 1212 cases and enucleation in 1276, the mortality for the former being 3.46 per cent and for the latter 0.7 per cent.

I am far from attributing an absolute value to these figures. In the first place, we must not forget that thyroidectomy is much the older operation. Its mortality rate must have been raised by the early work in the dark, by errors in asepsis, and by the use and abuse of antiseptics, while enucleation, coming in later, had the benefit of surgical progress.

Furthermore, we know that operative mortality has diminished in such proportions that its relative rate has lost almost all importance. When the difference in mortality is only trifling, it may be due to accidental factors and loses all value in the choice of a method.

I do not go so far as to affirm that thyroidectomy is to-day more dangerous from the point of view of operative mortality, but in any case, I can say that, so far as I know, enucleation is not its inferior as a method. I repeat what I have already said as to hemorrhage, of which the danger is more apparent than real in judiciously chosen cases wherein enucleation is not contraindicated.

As I have already said in many places in this paper, I am far from thinking that intraglandular enucleation should be applied indiscriminately to all cases, and it is now left to me to establish the indications and contraindications.

Everybody is in accord as to the treatment of liquid cysts by enucleation, and no other method equals it in regard to rapidity and perfection of healing. In my opinion, there should be the same feeling regarding operation on such solid benign tumors as present the same characteristics of limitation and connection with the enveloping gland, namely, benign adenomata. It is true that their enucleation is more bloody than that of liquid cysts, but the operative hemorrhage, save in rare cases, is not sufficiently profuse to constitute a real danger. Tumors of large size are exceptional and if bleeding be very free, I do not believe that with the technical precautions I have indicated it need disquiet the surgeon. When the tumors are multiple, which is by no means rare, I see no contraindication, as the different tumors can be enucleated either through a single incision or through multiple incisions of the encapsulating gland. The operation will be prolonged, but its dangers not thereby increased. There are, however, circumstances under which enucleation should be given up, either at the beginning, or during the course of the operation. It is clear that it is much preferable to avoid changing the method during the operation, and that the surgeon shall use all his skill beforehand in the judicious selection of the method.

Extirpation of the gland should be preferred to enucleation in the case of very vascular tumors, above all when pulsatile. To undertake enucleation of such tumors would be too dangerous for the patient, and in such cases partial extirpation of the gland, after preliminary ligation of the subcutaneous and deep veins and the thyroid arteries, can be done without excessive loss of blood. We should, in these cases, unhesitatingly choose extirpation instead of enucleation.

Generally speaking, extirpation will be equally preferable to enucleation in goitres which have previously undergone treatment with parenchymatous injections and have become hard. In these, it is only with the greatest difficulty that we can separate the adenomata from the surrounding tissues to which they have become adherent; the plane of cleavage, normally delicate and easily broken up, is so modified that the operator is in danger of breaking into the tumor itself, and thus losing the advantages of the correctly performed operation.

For the same reason I believe extirpation the only method applicable to inflamed goitres, in which cases also enucleation would expose the gland tissue proper to infection. Furthermore, enucleation is generally impracticable under such conditions.

In conclusion, it is my opinion that intraglandular enucleation is indicated in every case where it can be carried out without danger. It should be given preference in all enucleable tumors, liquid or solid, which are not excessively vascular and where the connections of the tumor with the enveloping gland have not been modified by irritants or inflammation. Partial thyroidectomy should be reserved for diffuse neoplasms or for very vascular adenomata, or such as have become adherent to their glandular envelope.

SUMMARY.

Intraglandular enucleation of goitres or the Porta-Socin operation presents the following advantages:

It does not expose neighboring structures (recurrents, etc.) to immediate or subsequent lesions.

It saves all the healthy thyroid tissue as well as the parathyroids, consequently avoids thyroid or parathyroid insufficience.

It leaves, in case of recurrence, the possibility of intervention without exposing the patient to the dangers of myxedema.

Its results are very good from the cosmetic point of view, and its rate of mortality is very low.

The danger of hemorrhage that might occur has been much exaggerated, and if recurrences are more frequent than after partial thyroidectomy, they are amenable to operation without serious consequences.

Intraglandular enucleation is not useful except for benign encysted tumors, liquid or solid. It is contraindicated if the tumors are exceedingly vascular, or adherent to the enveloping gland because of previous treatment or inflammation.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

A regular meeting was held December 6, 1907, with the President, Dr. A. J. Ochsner, in the Chair.

Dr. J. B. Murphy read a paper on "Tuberculosis of the Patella." (See paper, p. 262.)

DISCUSSION.

Dr. Arthur Dean Bevan: I have been very much interested in the presentation made by Dr. Murphy, and was much impressed with what he said, especially about the placing of the joint in a condition in which it will resist any possible infection by this chemical inflammation which precedes the operative treatment. I have had but a limited experience with these cases; I recall now but one case of tuberculosis of the knee joint, in which the patella was the primary focus. In that case, we found a single bean-shaped focus in the patella, with an extension of the process to the synovial membrane, and the operation consisted merely in opening the joint, sawing through the patella, finding the focus, removing it, and making a clean dissection of the synovial membrane, with iodoformization, and then closure of the divided patella, and the result was one of the best which I have had in operative work for tuberculosis of the knee.

I want to ask Dr. Murphy, when he closes the discussion, if, at the time he operated on these cases of tuberculosis of the patella, the operation was so planned that the synovial membrane of the joint was removed, and if the operation was so planned that all possible foci in the femur or tibia might have been discovered? I ask this question, because I can remember clearly in my work on the knee joint of finding a number of cases in which there were foci in the major bones, either the femur or the tibia, with, at the same time, involvement of the patella. I did not get a clear idea of the exact technique of the operation, and I would ask Dr. Murphy to bring that out also in his closing remarks, as I am sure it will be of interest to all of us.

Dr. William J. Mayo, of Rochester, Minn., was asked to participate in the discussion. He said: Mr. President, I was very much interested in Dr. Murphy's paper, and recall one case of apparent primary tuberculosis of the patella, in which the patella was removed with a very good result following. I did not quite catch the technique described by Dr. Murphy. In our case, the parts were approximated with chromic catgut, and the result, as I have said, was excellent.

One thing that struck me was the statement by Dr. Murphy, that primary operation for fracture of the patella had become obsolete. I would agree that the intermediate operation is unsafe, but I have not seen any difficulty from doing the primary operation in certain cases, seen a few hours from the time of the injury, before there was joint effusion, and where there was but little injury to the knee joint outside of the patellar fracture. In the intermediate stage, say from twenty-four hours to the end of a week, unfortunate results sometimes occur following operation.

I was particularly interested in what Dr. Murphy had to say about formalin-glycerine injections. As to what part glycerine plays, I am not able to say. I do know, however, that when we used iodoform in olive oil, in our work, we did not get the good results we got when using iodoform and glycerine, and in talking with Dr. Dudley Allan, in Cleveland, I was rather impressed with the fact that where we have been using ten per cent emulsion of iodoform and glycerine, he had been using about one per cent, and was getting the same results. We came to the conclusion that some of the good might be due to the hygroscopic effect of the glycerine. I shall be glad, however, to try the formalin-glycerine treatment suggested by Dr. Murphy in cases of chronic hydrops of the knee joint. At the same time, before putting anything into a clean joint, before operating on it to prevent possible infection, I shall want more evidence of the value of such procedures than I have at the present time.

Dr. W. E. Schroeder: I have had some experience with fractures of the patella, and do not hesitate to operate on them as soon as possible, and I do not recall ever having had an unfavorable result by so doing. In the cases produced by an indirect violence, there seems to be no indication for delaying. Here we would only expect a hemorrhage to take place, which could be prevented

by an immediate operation. In the cases in which there have been contusions, I have not hesitated to operate as soon as convenient, with equally good results. The circular suture was used, and the material was catgut, wire, or silk, and with seemingly good results.

Dr. Charles L. Scudder, of Boston, was asked to discuss Dr. Murphy's paper. He said: It is an unexpected pleasure to be here, and asked to attend a meeting of the Chicago Surgical Society. I came merely as a listener.

I have had no personal experience with tubercular osteomyelitis of the patella; but I recall a case of double fracture of the patella in which the bones were so comminuted and literally smashed, that they could be rendered of no use to the individual, but in which both patellæ were removed, and the fracture used to connect the quadriceps with the patellar tendon. In this case the functional usefulness of both knees was excellent. The patella seems to be, under certain conditions, unnecessary for good locomotion.

The custom at the Massachussetts General Hospital, in Boston, has been, for a number of years past, to operate secondarily upon fractures of the patella, but almost all fractures of the patella are sutured, usually not with wire, or a metallic suture, and the operation is done after a week or ten days. I think one of the reasons, in addition to the one suggested by Dr. Murphy, for delay in operating is that the maximum primary effusion is evacuated at the time of the secondary operation, and the joint is then in a very quiescent state, and consequently there is no tension in the joint after the suture. Of course, the reason which Dr. Murphy gave for the secondary operation is the one generally accepted as the important reason for the secondary suture, namely, that sepsis is less likely to occur. I recall no instance of tuberculosis of the patella.

Dr. Daniel N. Eisendrath: I was much interested in the case Dr. Murphy showed, and in the result following excision of the patella, in that it confirms my observations of one case of excision of the patella, combined with a resection or arthrectomy of the knee joint, in which the power of extension was as perfect as in his case. It also confirms what we have occasion to see quite frequently after fractures of the patella. Last spring, I was consulted by a patient who had a fracture of the patella two years before, and who had separation of two and a half inches between the fragments of the patella. As there was a palpable deformity, the question arose as to whether an operation would be of some avail. I tested the power of extension, which was about as perfect as that in the case exhibited by Dr. Murphy. We find this not infrequently, and our attention has been called to it of late through some anatomical investigations of a German, who finds that there are a considerable number of fibers, which he calls accessory ligaments of the knee joint, which have not been considered in estimating the power of extension of the quadriceps extensor, plus these accessory ligaments, when the patella has been removed. This work confirms, too, previous observations that were made clinically, and puts the matter on a more or less scientific basis. We can now feel safe to excise a patella without loss of power of extension of the knee joint.

I was interested in looking up the statistics of Professor Koenig, who has had a very extensive experience with tuberculosis of bones and joints. In his book, just issued, on Tuberculosis of Bones and Joints, he states that among 720 cases of tuberculosis of the knee joint, the patella was involved fifty times altogether, and of these fifty cases, thirty-three were primary. These are the only figures, so far as I am aware, extant, as to the frequency of the condition. He states that it was practically impossible for him to operate on the patella itself without being obliged, sooner or later, to operate on the knee joint, so that this may have some bearing on future cases. Furthermore, he says that, of the secondary operations, he was obliged to do resection in twenty-two cases, and arthrectomy in nine.

Dr. M. L. Harris: I have not seen any case of primary tuberculosis of the patella. In all the cases I have seen, in which the patella has been involved, the other bones of the knee have likewise been involved. Although I have removed the patella two or three times in these cases, the operations have always been more extensive than simply the removal of the patella, because other bones were involved, so that the cases are not pertinent to this particular discussion.

Regarding fractures of the patella, it has been my rule to operate on practically all cases. In fact, I operate on all cases unless there is some distinct contra-indication. It has likewise been my rule to wait until the stage of effusion had passed; in other words, until the effusion, which always takes place, begins to subside. That will vary from two or three days to a week. I have been desirous of waiting until the effusion begins to subside, in order not to operate upon a joint which is subsequently going to fill up with fluid. If we operate on a fracture of the patella immediately, the joint will certainly fill up with fluid, and very much increase the effusion, and tend to separate the fragments. Another reason is that the joint, I

believe, and as Dr. Murphy states, is less likely to infection, because the blood, which always escapes into the joint, is one of the best agents we know of to produce a leucocytosis. Hemorrhage into one of the cavities of the body will produce a general leucocytosis within a few hours. I have seen a very small amount of blood effused, into the peritoneal cavity, double the number of leucocytes within two hours, making counts immediately on the receipt of the injury, and every hour subsequently. Blood, therefore, in the knee joint produces a local leucocytosis, which, I believe, is one of the best protective agents against local infection. To me, therefore, the time of election to operation on a fracture of the patella is when the effusion has reached its height, and has begun to decline.

Dr. Allen B. Kanavel then read a paper on "The Complications of Teno-synovitis," which will appear later in this journal.

Discussion on the paper of Dr. Kanavel.

Dr. D. N. Eisendrath: Dr. Kanavel, at the end of his paper, brought out a point in regard to the treatment of the tendon sheaths, whether they should be opened freely or not, and the same with regard to the annular ligament.

When I was in Hamburg, at Sick's clinic, the doctrine was promulgated to proceed in the way Dr. Kanavel has done; that is, open the tendon sheath from one end to the other, following it up through the annular ligament and going through that ligament. Since that time we have had necrosis of the tendon itself, or quite frequently from this radical surgical work, so that it really seems desirable to pursue a more conservative plan, and that is especially true in cutting through the annular ligament. Invariably, the moment you cut through the annular ligament in these cases of severe infection, involving the tendon sheaths, all the tendons prolapse, and it is difficult to get a good result again. It is better to use a paratendon incision, not laying open the entire tendon sheath, but, from the edge, instituting drainage material to establish free drainage without opening the entire radial bursa of the tendon sheaths of the fingers. The same is true of the tendon sheath through the annular ligament. We thus avoid necrosis, if possible, of the tendons.

Dr. Arthur Dean Bevan: I would like to ask Dr. Kanavel, in closing, as to whether he uses the bloodless method in his dissections or not?

Two things have impressed me as being of the greatest value in dealing with these cases: One is complete narcosis, which comes from ether or chloroform, or preferably gas, and the other, making the parts absolutely bloodless by means of a rubber bandage. I am impressed with this fact, that many of the bad results from suppurative processes about the hands and fingers are due to the fact that, without the bloodless method and a general anæsthetic, the surgeon is likely to make an indefinite stab into the finger, or into the palm of the hand, with the idea of draining the pus and of finding a pocket of pus, and as a result of such faulty technique, frequently fails to obtain proper drainage. The most satisfactory thing to me is, to have the patient absolutely under the influence of the anæsthetic, and have the operation absolutely bloodless, starting in at the point of infection to make the dissection, and following up the pus, with the very definite idea, of seeing the gross macroscopic evidence of inflammation, and following that to wherever it leads, and instituting drainage wherever necessary.

I hope that Dr. Kanavel's careful study of this subject will result in his formulating some simple and definite rules which can be of value to us all in treating these hand infections.

Dr. Kanavel (closing the discussion): In reply to the remarks made by Dr. Bevan, I will say that it is my custom to apply a constrictor to the arm while operating, but that I do not apply the complete bloodless method to which he has reference. I loosen this constrictor somewhat, and leave it on as a Bier's constrictor, to produce a passive hyperemia.

Concerning the remarks of Dr. Eisendrath, I will say that splitting of the anterior annular ligaments is a method that has been used a number of years and was first suggested by Helferich, as far as I know. Paulson and others insert a rubber tube underneath the anterior annular ligament, but Forssell has drawn attention to the fact that this is prone to cause sloughing of the tendon, because of the great pressure. If the pockets are properly drained, I have not seen the extensive prolapse mentioned.

CHICAGO SURGICAL SOCIETY

A joint meeting of the Chicago Medical and Chicago Surgical Societies was held January 8, 1908, with Dr. A. J. Ochsner, President of the Chicago Surgical Society, in the Chair.

Dr. William M. Harsha reported a case of tuberculosis of the tongue and exhibited the patient. (See article, p. 28.)

DISCUSSION

Dr. Arthur D. Bevan: In 1893 I saw a case very much similar to this. I had shortly before learned how to stain for tubercle bacilli, and it was a case which I thought at the time was an epithelioma of the tongue. The patient, however, had, as this case has, some tubercle bacilli in the sputum, and the diagnosis in that case was made by taking some scrapings from the lesion of the tongue and staining for the tubercle bacilli. I found the tubercle bacilli in the scrapings, and made a diagnosis of tuberculosis of the tongue. The man had also a fairly advanced tuberculosis of the lungs.

I should like, however, in this connection, to refer briefly to a case in which the question of diagnosis was very important, and in which we had the same pathological process to deal with as here — a man of 50, with a lesion on the glans penis, which, from macroscopic appearance, was apparently a typical epithelioma; I believe it was a typical epithelioma. Amputation was advised; a section of tissue was taken and examined, and much to my surprise, and to the surprise of the men associated with me, we found it was not epithelioma at all, but a case of tuberculosis of the penis, resembling clinically very closely an epithelioma.

I think the case is an important one, as Dr. Harsha presents it, especially from the standpoint of differential diagnosis.

Dr. John B. Murphy: I wish to congratulate Dr. Harsha on the presentation of this case, particularly on making the diagnosis before the operation. The case, as it presents itself, has all the classic forms of tuberculosis; namely, it was first a submucous tuberculosis from inoculation from a tooth, and that remained beneath the mucosa for a considerable time, and he had an ulcer appearing on the surface, giving the ulcerative variety where the mucosa is destroyed, leaving a primary lesion and a superficial lesion, and each of the two succeeding ones in this case was in advance of that, and of the ulcerative variety.

In the differential diagnosis, there is no growth in the tongue that is so hard to differentiate, either macroscopically or microscopically, as a tuberculosis of the tongue, as the appearance of the ulcer is not present.

With reference to the microscopical examination, scrapings from the tongue are often the scrapings from the lungs; that is, they come up and have been deposited on the tongue. That has been shown a number of times. The tuberculous material is found in the crevices of the tongue, as well as in the crevices of the ulcer, which does not indicate that it came from the ulcer of the tongue; and then comes the unsatisfactory part, namely, often you do not find the typical or classical picture microscopically. There is an absence of the giant cells. You find epithelial cells mixed together so that they do not present the typical form under the micoscope, and that accounts for the absence of a diagnosis of the first microscopical examination, as reported by Dr. Harsha. The diagnosis, from the macroscopic standpoint, is made by the secondary enlargement of the glands; its resemblance to epithelioma, and in a number of these cases the glands, when examined secondarily, do not show the typical tuberculosis, but a mixed infection. They are either encapsulated tuberculous glands, or it is simply a mixed infection.

The clinical course is always doubtful. It is as grave a lesion in itself as carcinoma of the tongue, and then you have added, the original primary tubercular lesion.

Dr. Harsha is to be congratulated on this case. Why? Because there was no evidence of tuberculosis any place in the body that was recognized at the time the patient presented himself, and the evidence of tuberculosis did not appear until a long time afterwards, and primary tuberculosis of the tongue is a rare disease.

The prognosis is unfavorable, even after radical removal of as large a portion as we would ordinarily remove in a case of epithelioma of the tongue. It requires the excision of a larger portion than in excision for carcinoma, to feel that the patient is free from the secondary return *in loco*.

Dr. William Allen Pusey: In connection with this case of Dr. Harsha, I should like to report a case of tuberculosis of the mucous membrane of the mouth and tongue, which was recently under the joint treatment of Dr. Thomas L. Gilmer and myself, the diagnosis of tuberculosis being made by Dr. Gilmer before I saw the case. Although I did not hear all of Dr. Harsha's paper,

I think our case presented very distinct differences from the one which he reports.

In this case the lesions corresponded to the very superficial tuberculous ulcers which sometimes occur about the mucous orifices of the body, in connection with systemic tuberculosis. There were lesions on the tip and side of the tongue, on the buccal mucous membrane, and upon that of the soft palate. There were no enlarged glands, and there were no deep ulcerative lesions. The case was not one of tuberculous gummata. In our case, the difficulty of diagnosis was not from epithelioma, or from other malignant growths, but from lesions which produce very superficial excoriations. The lesions here were extremely superficial ulcerations, covered by a necrotic membrane, and surrounded by an inflammatory areola. They most closely resembled extensive mucous patches. Another condition, which had to be excluded in this case, was pemphigus, beginning in the mouth. Pemphigus occasionally begins in the mouth without lesions elsewhere and it may produce lesions in that location quite identical in appearance with the superficial lesion of tuberculosis which occurred in our case.

In all of these cases of tuberculosis of the mouth, a positive macroscopical diagnosis is, I believe, impossible; but in most cases, it is my impression that the microscopical diagnosis is not difficult, because tubercle bacilli are to be found abundantly in the scrapings from the ulcers, and are comparatively easily found in the tissues — with nothing like the difficulty that attends their finding in lupus.

In this case, the structure was that of a typical miliary tuberculosis. The original diagnosis was, in fact, made upon the structure, and no difficulty was found in demonstrating the bacilli in the tissue. I think these lesions are extremely rare, certainly excessively rare without systemic tuberculosis. In our particular case, there was slight, if any, evidence of active pulmonary tuberculosis, but there was evidence of old tuberculosis, and the patient was extremely cachetic. The course of the case was rapidly downward. The lesions were excruciatingly painful, so that the taking even of bland liquid food was attended by great pain, and solid food was impossible without first spraying the lesions with cocaine. The patient died within two months after the development of the lesions in the mouth.

Dr. L. L. McArthur: I rise to make a query of Dr. Harsha relative to his case, as to whether an exquisite tenderness and painfulness of this lesion existed, such as exists in lesions of that kind of which I have had personal cognizance. In this case, the tenderness and suffering from the lesion were to be likened to ulceration which comes from an X-ray burn — painful to the slightest touch.

I had occasion to make a diagnosis and remove a growth of this kind from a patient of Dr. Frank Carey's, fifteen years ago, and the diagnosis was made by means of the microscope. I think, practically, we have three things to differentiate in ulceration of this type. It is either epithelioma, tuberculosis, or syphilis. The other lesions are so rare that they are hardly to be considered, and if epithelioma is ruled out by microscopical examination, which it can be, there remains but the syphilitic and the tubercular types to be considered. With a syphilitic lesion, we have simply the round cell lymphoid infiltration tissue. With multiple sections from the fragments removed, we can ultimately find giant cells, and find in them the tubercle bacilli.

I do not feel like agreeing with the extremely grave prognosis that Dr. Murphy gives in regard to tuberculosis of the tongue. I think that the radical removal will offer a far greater hope of recovery than in cases of carcinoma.

Dr. Harsha (closing the discussion): In regard to the discussions which the gentlemen have kindly made, I will say that in Della Vedova's article there is set forth the result of an extensive study of the subject. He says that it is a difficult matter to make a diagnosis from scrapings, or from sections, taken from the nodular or submucous type; that the bacilli are not commonly found in the tissue, and that the best way to make the diagnosis is to cut out a section from the border of the ulcer. The first section in this case showed nothing more than inflammatory tissue. It showed no bacilli, and no typical tubercular histological formation.

The second microscopical examination was made from the section including the whole border of the ulcer, and was positive. Now, these ulcers were not entirely superficial. They were not like mucous patches; they went through the fascial layer, and down to the muscle. Another characteristic was that, in spite of ordinary treatment — the cautery, expectant, and antiseptic treatment — they spread peripherally, but were not ragged.

In answer to Dr. McArthur, I will say that neither the ulcers nor the primary nodule were at all painful. The first one, the nodule, had on top only a minute ulcer. There was no pain on handling it. It felt hard, and seemed only to interfere somewhat with movement of tongue and with phonation.

Dr. Willard Bartlett, of St. Louis, Mo., read a paper, by invitation, entitled The Prophylactic Use of Filigree in Infected Wounds of the Abdominal Wall. (See paper, p. 274.)

DISCUSSION ON DR. BARTLETT'S PAPER

Dr. D. A. K. Steele: I wish to congratulate Dr. Bartlett upon the success that has attended his efforts in the last six years in the introduction of a silver wire filigree within the muscles or beneath the muscular sheaths or fascia of the abdominal wall, as a permanent barrier to post-operative hernias; and especially on his paper to-night, which teaches us that it is possible to implant a filigree in an infected wound of the abdominal wall, and have its silver strands become a permanent part of the scar tissue, preventing hernia, and causing no local irritation, even though in the lapse of time the original network may become broken or separated into fragments.

These results have been exceedingly interesting and instructive to me, because I have always regarded the permanent introduction of non-absorbable material — such as silver wire, iron wire, silk or silkworm gut — into the living tissues as objectionable, on account of the frequent necessity for its removal later on by reason of irritation, infection or discomfort to the patient. Many times in the last thirty years I have been called upon to remove buried loops of wire or silk that had produced distressing symptoms, and I know that Phelps' permanent silver wire sutures in hernia have many times required removal for the same cause.

Up to this time I have had no personal experience in the use of Dr. Bartlett's filigree, but predict that, in the hands of a less expert surgeon, it will occasionally fail, irritate, or require removal. I admire Dr. Bartlett's ingenuity, enthusiasm, persistence and success, and have no desire in any way unfavorably to criticise his method, while expressing a personal preference for autoplastic methods, and my belief that in similar cases to those described by him it would be perfectly feasible to bring the muscular or aponeurotic structures in close apposition by the use of the herring-bone suture of chromicized catgut or kangaroo tendon, that would give equally as good permanent results. Although I must also say that there are certain cases, where there is a large defect in the abdominal wall, where better results can probably be obtained by using the filigree. I presume it would not be applicable in the abdominal wall of a young child or in a pregnant woman.

It seems probable that the implantation of continuous loops of silver wire in granulation tissue is less likely to be disturbed by the contractions of overlapping muscular planes occupying different levels, and contracting in different directions, in the abdominal wall, than would be caused by single loops of wire.

The skiagraphs in the three cases subjected to the X-Ray all show the filigree broken into fragments after five and one half years, over two years, and a couple of years, respectively. Will these fragments cause any subsequent irritation after they have answered their purpose in curing or preventing a hernia?

Dr. Alexander Hugh Ferguson: We are indebted to Dr. Bartlett for again bringing to our attention this device for the prevention and cure of hernia. I am not in a position to discuss the filigree, inasmuch as, so far, I have not seen a case which I have not been able to handle satisfactorily by plastic procedures. There have been, however, some cases in which I have refused to operate. These might be suitable for the filigree.

I was much interested in what Dr. Bartlett had to say at the meeting of the American Medical Association in Boston, and was favorably impressed with the results obtained from the use of the filigree under certain very rare conditions, but the doctor makes a bold stroke here to-night, and advises the use of the filigree as a prophylactic measure in suppurating wounds of the abdominal wall. This has been a source of astonishment to me, and at first thought I would be inclined to pass it aside as unsurgical; however, I will reserve that decision until more cases have been presented to us, and until Dr. Bartlett either makes a complete success, as shown by the report of his own cases, or those of others, if in the mean time he does not discard the filigree. One can very readily perceive the advantages for using the filigree. For instance, in the case of very large, gaping wounds, it is much easier to insert the filigree, although I will not say that it is less dangerous, than to approximate the tissues by well-known surgical methods. The ease of application would induce a great number of men to try it, who, probably, would not undertake a plastic operation.

The author's statistics are in favor of it, although sufficient time has not elapsed since he began to use it, as he has pointed out. The various bits of wire may give trouble later on. In fact, the instability of any foreign material in the tissues of the body, except those that are purely passive, is well known, and the action of the juices of the tissues upon the different foreign materials, especially metals, is fairly well known. It is not at all a new thing that silver wire will remain in place, and

granulation tissue form over it, in a suppurating wound, and eventually become encysted. The same is true of aluminum bronze and of the wire used by dentists. The juices of the tissues have a digestive action on the wire, and the active motion of the abdominal walls tends to break it up. That we know from our experience with the use of silver pins in holding bone-fragments together. In two or three weeks there is nothing left but the iron. The silver is all dissolved away from the nail.

Whether the cures effected by the filigree will be permanent, it is too early to say. The first disadvantage of the filigree is, that it is a foreign body. Second, it is instable in the tissues. Third, it is questionable whether it is a prophylactic against hernia. We have other means, better ones than the filigree, for the prevention of hernia. In most cases of postoperative, hernia, the indications for operation are clear, on account of the disturbances which they produce. The hernia gives rise to adhesions and agglutination of the bowel, so that the insertion of a filigree, without opening the abdomen, and liberating the adhesions, would not cure or relieve the sources of pain and discomfort in many of these cases.

Dr. M. L. Harris: Ever since wire methods were brought out by Witzel in Europe, and Phelps in this country, I have been unfavorable to them on the ground that it was the implantation of a non-absorbable material which we know from experience usually comes out sooner or later. I, therefore, have had no experience in implanting silver wire filigree, but I have had some experience in taking them out.

The first case which I had was some two years ago. The patient had been operated on several times, primarily for appendicitis, I believe, and then to close a ventral hernia, and finally a wire mattress or filigree was implanted in the abdominal wall. It healed in nicely, but, after a time, it gave the patient so much trouble and so much pain that he absolutely insisted on having it removed. It affected him, mentally as well as physically, so much that he threatened suicide unless I got that mattress out. The wire had broken up into small pieces, each one of which furnished one or two ends which were sticking in the tissues. I worked for a couple of hours in digging and taking out these numerous little pieces of wire.

The next case was more recent. In fact, it is only about two weeks ago since I had to take out another mesh of silver wire buried in the abdominal wall. This patient, too, suffered considerably; and it illustrates the fact which Dr. Bartlett mentioned, namely, the adhesions formed on the peritoneal surface between the omentum and other structures. How much, if any, of these adhesions were present before the wire was put in, of course I do not know. But I was much surprised to find how much wire lay directly beneath the peritoneum, where it evidently was put in in loops about the fascia or tissue. It lay directly flat and just beneath the peritoneum in loops; and beneath were numerous adhesions to the intestines as well as to the omentum. I had considerable difficulty in taking out all of this wire.

With this limited experience in these cases, I am not very favorable to implantation, although I must say that the results reported by Dr. Bartlett are certainly very good. It is to be hoped that the method in the future will prove successful, and that surgeons will not have to take out these mattresses as they have had to do in the past.

Dr. E. W. Andrews: We have had two valuable contributions from Dr. Bartlett—his modification of the cumol catgut sterilization and his modification of the Phelps and Willy Meyer filigrees. Both are highly praised by men of large experience, so that this opinion cannot but influence our judgment favorably.

The problem of closing a wound, such as that resulting from suppuration in the abdomen, is the only one embodied in Dr. Bartlett's paper to-night. The problem of closing a newly formed wound is a simpler thing. Dr. Ochsner has shown that in a case of simple femoral hernia, the chances are that, in the average case, where nothing more is done than the extirpation of the contents of the canal, complete union will take place after extirpating the sac. I have thought, in many cases of inguinal hernia of small size, our elaborate methods were possibly not necessary. Elimination of the peritoneal sac high up, with a slight support of bandages, allows the muscles to fall together, insuring often complete primary union. When we come to deal with the results of a suppurating wound, we are confronted with the problem of greater difficulty.

When the good mother closes a rent or a hole in the seat of trousers, she must do in it one of two ways. She must put on a patch or darn the hole. There is one thing she cannot do; she cannot sew it together laterally.

The same principle applies in closing wounds caused by injury or suppuration of the abdominal wall. The use of a patch or the use of the darning needle becomes essential.

The use of a patch brings us to innumerable efforts to close up hernial openings by a plastic flap; and, if you will look over literature, you will

see the multiplicity of operations of this sort that have been advised. Turning out the anterior rectus sheath, making a trap-door flap, turning up a trap-door flap from the fascia lata, invaginating the skin, inserting a bone-plug into the opening, the insertion of a silver plate, or the insertion of Phelps's wire coil, etc., and finally it brings us to the modification of Phelps's wire coil, the wire filigree of Meyer and that of Bartlett. The flap method consists of a plastic patch. The darning method is a new thing in surgery, and as I understand Dr. Bartlett, he has adopted a new principle. He inserts a filigree, which is a piece of darning work done over pegs before it is put in place. If I have a clear picture, it is simply this: that over a row of pegs a filigree is constructed by first darning artificially. Thus a kind of net-work is constructed which is able to stand alone and hold its shape. If I am right, we have a principle analogous to that of heteroplasty, as seen in the Moorhof bone-plug. This plug is absorbable and (unlike paraffin) is slowly displaced and replaced by fibrous or bone tissue. So with the wire net-work: granulation tissue and connective tissue fill out the interspaces. There can hardly be any question as to the practicability of this framework to fill large gaps.

Two principles, then, are available for large defects: the principle of the patch, and the principle of cross-bridging or darning. I have only to remind you that the darning principle is used in other ways, as when we bridge a gap in a divided tendon, or even a nerve, with strands of catgut in order to furnish a framework for tissue to regenerate upon.

Willy Meyer's filigree (shown at the American Surgical Association, 1902), is a loose-woven gauze of silver wire. Dr. Bartlett's form is lighter, and contains less waste or useless strands to cause irritation.

Dr. Bartlett (closing the discussion): Dr. Steele expressed the fear that this filigree would ultimately irritate the tissues so as to require its removal. I will not contradict that, because it may do so. The wire, however, is very fine, and in these 36 cases I have reported, varying from a few months to seven years, I have not personally seen any irritation in a single case, except one, where a portion of the filigree was right beneath the skin. I can not state, however, that some of the patients have not presented themselves to other surgeons, but they have not come back to me and complained of irritation. I never tell a patient when I introduce one.

In regard to autoplastic procedures, I agree with Dr. Steele that if an autoplasty can be used it is preferable to the implantation of a foreign body. He spoke of a child's abdominal wall. I introduced a filigree into the abdominal wall of a child, 12 years of age, four years ago, and there has been no impairment of development in that part of the abdominal wall.

With reference to pregnant women, I implanted a filigree in a woman who had had a hernia of sixteen years' standing. She became pregnant a year and a half after implantation, went through her pregnancy without the slightest damage, which occurred over a year ago, and no hernia has resulted.

Dr. Ferguson stated that no case had presented itself to him which he could not close by plastic means. I saw an extreme case closed by autoplasty this morning by Dr. Ochsner, and the majority of post-operative herniæ can be closed by autoplasty. Dr. Ferguson very fairly mentions the fact that cases now and then present themselves in which operation is refused, but which might be treated by filigree. I will state in this connection, that one of the most extreme cases I treated with filigree was a woman with a ring, measuring four and a half inches in diameter, very firm, which could not be approximated by two or three inches. Perhaps some of the rest of you could have done so. I have in the hospital now a woman in whom there is a ring of five by seven inches in size. If any of you think you can close that opening by autoplasty, I will be glad to send the woman up to you. I will not attempt it.

Dr. Harris mentions having taken out filigrees, but he was kind enough not to say I put in any of those which he took out. If he has taken out this form of filigree, I am perfectly willing that he should say so, as I want to have a fair grasp of the subject.

Dr. Harris also refers to those cases which sometimes necessitate removal, and mentions the fact that there are intra-abdominal adhesions to the scar. I should think it would be difficult to tell whether it was the filigree which caused the symptoms of adhesions or the conditions caused by the adhesions. However, I am not posing as a discusser, but as the discussed.

Dr. Andrews, I believe, fairly hits the nail on the head in making his remarks. A sort of trellis is formed. The filigree constitutes the network around and in which excessive scar tissue is built, and therefore, it is the resultant excessive scar tissue, and not so much the wires which cure the patient. My idea coincides with the statements of Dr. Ochsner. It is probable (because these things are placed parallel between the tissue planes) symptoms do not result, as would be the

case if the muscles are caught in the loops of permanent silver sutures.

I sincerely thank you for the discussion. It is really a pleasure to learn a lot of things about yourself and about your device, even though the remarks are not as flattering as one might expect. But I will state, in regard to the contrivance, not exactly in self-defense, that I have claimed nothing but temporary benefits in these cases. The oldest case in which filigree has been used is now nearly seven years, and it is all right so far. Only ten months have elapsed on the average in five cases where the filigree remains in an infected wound. I became enthusiastic after finding out that these things would heal in pus wounds, and when I found they would stay there ten months, I could not help telling you and others something about it.

Dr. A. D. Bevan and Dr. Walter Hamburger read a joint paper on Three Cases of Human Glanders.

DISCUSSION

Dr. Maxillian Herzog: Dr. Bevan has asked me to discuss his paper, and I rise to make a few remarks on the subject of glanders. Glanders is naturally a disease of horses and other solipeds, and it is very common almost all over the world in these animals. Australia, however, has kept free from this disease. If we consider what a large number of horses are infected, and that these infected animals are handled for long periods of time by human beings, then we can see the frequent chances for infection: however, the danger of infection ordinarily does not seem to be very great because man does not contract glanders from the horse very often. On the other hand, a comparatively large number of laboratory workers, handling cultures of the bacillus mallei, have infected themselves, and have contracted the disease by inhaling the bacilli.

The pathological lesions of glanders, as far as horses are concerned, are divided into the glanders ulceration, the glanders abscess, the glanders infiltration, and the glanders induration. So far as the human being is concerned, we must mention a fifth type of pathological lesion, which is, so far as the diagnosis is concerned, most important indeed — the glanders pustule. So common is the pustule in human glanders that most cases of human glanders have been wrongly diagnosticated as smallpox, particularly in countries where vaccination is not general. I had occasion to see the material from two such human glanders cases in Manila. These two cases were diagnosticated as smallpox, and the material handed over to two gentlemen, who were studying smallpox in Manila at that time. They recognized that the disease was not smallpox, and the bacteriological investigation by Dr. Werry established the diagnosis of glanders.

Commonly, the disease in the human simulates either smallpox, pyemia, erysipelas, or syphilis. Of course, it ought to be very easy to differentiate glanders from those diseases, because examination of the pus from the lesion shows the typical bacilli, and we have an absolute test which can be made in a few days, namely, the biological test, which has been mentioned this evening, the inoculation of the guinea pig. If you take material obtained from a case of glanders and inject it into the peritoneum of a guinea pig in the region of the bladder, there will develop a swelling of the testicles and microscopic examination reveals large numbers of bacilli in the inflamed serous surfaces.

The agglutination test has been mentioned. That test, so far as I am aware, has not been tried in the case of human infection. In the case of glanders in horses, it has been tried, but found wanting, for the following reasons: The normal horse blood-serum varies greatly in its agglutinating value towards the glanders bacillus, and, again, blood-serum from horses having the disease, also varies from several hundred to several thousand times, so that according to veterinarians who have had a large experience with the test, it is not to be considered reliable. An English veterinarian has tabulated several thousand cases, and he came to the conclusion that the agglutination test is not reliable. The mallein test is much more reliable. But we have, in the biological test, a very reliable diagnostic method which can be made in a few days.

Glanders, in the horse as well as in the human, may run an acute or a chronic course. Dr. Bevan told us to-night that two of his three cases are on the road to recovery. That may mean that they will get permanently well, or it may mean that a sudden acute exacerbation will occur which may terminate fatally. In both of the Manila cases the patients, after chronic manifestations, died speedily from a general dissemination of the bacilli. Of the cases that have been reported to-night, one presented an abscess, not in, but over the joint. One of the Manila cases showed the same condition.

Dr. Bevan is to be congratulated on having established the diagnosis, and his work in connection with these cases forms a valuable contribution to the subject of glanders in the human race, a subject which has not been thoroughly worked out.

DISCUSSION OF DR. BEVAN'S PAPER ON GLANDERS

Dr. F. Robert Zeit: I wish to add two more cases of glanders in our city, one a chronic case of Dr. J. T. Campbell, and the other an acute case with pustular eruption, which occurred in the practice of Dr. Bayard Holmes, at Wesley Hospital. The patient was suspected of having smallpox, and Dr. Holmes asked me to see the case. The eruption came on over night. The patient came to the Hospital on Friday, and Saturday morning there was a generalized pustular eruption. The clinical picture, at first sight, was that of smallpox. The pustules covered nearly the whole body, but were most numerous on face, arms, shoulders and chest. Probably some of you have seen photographs of this case. There was a bloody, seropurulent discharge from the nose, with swelling of the face. There was marked œdema of the scrotum and a large gangrenous ulcer of the glans penis. Upon closer examination of the pustules we decided that the case was not one of smallpox. The pustules were of different sizes. The majority of them were of the size of small peas. None of them was umbilicated. There were some papules. We concluded that it was not smallpox. In view of the presence of a large sloughing ulcer of the glans penis, we naturally suspected a pustular syphilide. We made cover glass smears of a number of the pustules from different parts of the body, and to our consternation found great numbers of bacilli in all the smears. There were as many as thirty or forty bacilli to every field. The patient died the same day (Saturday). He was a teamster. There is no question that cases of glanders can easily be mistaken for smallpox, and that they are more numerous in the city than we have heretofore supposed. Such slightly atypical of suspected cases of smallpox may go to the pesthouse on account of the great similarity of the two diseases, and die there; and the fact that they die there, might easily lead to the conclusion that they have had smallpox. Unless one is specially on the lookout for glanders, smallpox is diagnosed.

The diagnosis of glanders is comparatively easy. A cover glass smear of the pus from the pustules shows large numbers of bacilli, somewhat longer and thicker than tubercle bacilli. They stain irregularly, and therefore are somewhat striated. With Loeffler Blue and heating, the portions rich in chromatin stain deep blue; the ground substance remains pale. This irregular staining of the bacillus produces the peculiar striated appearance.

In our case we also made cultures and had typical potato cultures of glanders bacilli. By typical, I mean a potato culture which looks macroscopically very much like the staphylococcus aureus, and if a careless microscopical examination of this culture is made, one can easily conclude that it is the staphylococcus aureus instead of the bacillus of glanders, on account of the irregular staining of the bacilli in striæ, and globules which then appear like cocci in a delicate network. To guard against this common error, thin smears of suspensions are necessary when examining cultures.

The other case was one of chronic glanders of long standing. A young man, who had been engaged by the English government to bring loads of horses from New Orleans to South Africa during the Boer War, came to the clinic of Dr. Campbell with an ulcerative inflammation of the mucous membrane of the nose. He had an ulcer which nearly perforated the septum, very much like the characteristic typical ulcer that forms in horses with glanders, that is, a perforating ulcer of the septum. He had enlarged lymph nodes of the neck, axilla and groin, and numerous scars in these locations from former surgical removals of nodes and curetted suppurating glands. On the ship on which he was, nearly all the horses developed a discharge from the nose, enlarged lymph nodes which suppurated, and swollen lymphatics, and nearly three-fourths of them had to be thrown overboard, dying rapidly. Of the men who attended to these horses, a number died, having similar symptoms.

The acute cases die in the course of two or three weeks. But what becomes of the chronic case? It apparently never gets well. It may take on an acute character and prove fatal at any time; or it may remain chronic for years, as in this case. I have lately heard from this young man through a physician in St. Louis, and find that he still has the same symptoms. He occasionally goes to a surgeon and has suppurating lymph nodes removed or curetted. He still has the same disease. Potassium Iodide has no effect.

I am very glad to have listened to the interesting papers of Drs. Bevan and Hamburger, which go to show that glanders is more prevalent than generally supposed, if looked for carefully. The acute cases are hopeless, but in the chronic cases the judicious use of Mallein might be tried. Only few cases become immune and recover.

Dr. Adolph Gehrmann: I would like to mention a still earlier case of glanders, than the one related by Dr. Zeit, and which was demonstrated before this society some fifteen years ago. This case also occurred in the practice of Dr.

Holmes. The young man had an infection about the neck. The bacteriological work was done by the late Frank S. Billings in this city, and I remember very well his demonstration of a guinea pig before the society.

Glanders, as it occurs to-day, probably should not escape our attention as it did years ago. I am quite sure, there were cases of glanders which escaped attention of clinicians, surgeons, and bacteriologists entirely, and that we had more cases of glanderous infection in the human subject than we have to-day. I remember having to do with the infection in street-car horses, which occurred in epidemic form in different barns years ago, before the introduction of our modern methods of transportation. A barn at 39th Street and State was a veritable hotbed for glanders. Numerous horses died of glanders, so that we had an opportunity to test the accuracy of the mallein test; this test was made and the animals that reacted were taken to the stock yards and slaughtered. I was present on a number of occasions, and saw from 12 to 20 horses at a time condemned on the test. Dr. Trumbower, State Veterinarian at that time came, to the conclusion that he could not be absolutely sure of the mallein test in horses. Some horses were infected as was proven by taking specimens and making bacteriological examination. We found horses that reacted clinically in which there was no lesion which we could attribute to, or consider as, being glanders. Therefore, its value in the chronic case as a diagnostic method was not favorably considered. To-day, of course, under bacteriological methods, especially the biological test on guinea pig, and keeping in mind the possibility of this infection in any case, the diagnosis could be made a certainty.

In this connection, I recall an interesting report from the Royal Victoria Hospital of Montreal, of a case of glanders in a man who lived having the disease for about seven years, having several exacerbations, but finally died of a generalized infection.

Dr. D. A. K. Steele reported cases and exhibited the following specimens: (*a*) Stab Wound of Fetus in Utero at Six and a Half Months. Delivery of Live Child at Full Term. (See paper, p. 293). (*b*) Inversion of Uterus During Labor, with Subsequent Gangrene. (*c*) Fibroma of Broad Ligament.

REPORT OF A CASE OF AN INVERSION OF THE UTERUS FOLLOWING DELIVERY; WITH GANGRENE. OPERATION — HYSTERECTOMY. DEATH FROM SEPTICÆMIA. AUTOPSY.

November 23rd, 1907, I was called to see Mrs. P. B., age 23, who presented the following history: She was delivered by a midwife on the 21st of November of a normal male child. There were no complications. The labor was easy, and, after caring for the infant, the midwife attempted to remove the afterbirth, which she said came away easily and without much traction. Immediately after its removal, the patient began to flow profusely, and the midwife noticed the protrusion of a large, fleshy mass from the vagina, which she at first mistook for a second child. She attempted to deliver it, and finding that impossible, and that some unusual complication was present in the case such as she had never seen, she sent for a neighboring physician, Dr. J., who diagnosed a complete inversion of the uterus and attempted to replace it, but did not succeed. He gave the woman ergot and morphine and advised waiting. Several hours later, another physician was called in consultation; chloroform was administered, and the uterus was believed to have been replaced, and the inversion overcome. About 4 o'clock Saturday morning — the day that I was called in consultation — 48 hours after delivery, the uterus was again found to be inverted and protruding from the vagina. There was a fetid odor, the uterine mucosa and muscularis were gangrenous over the protruding fundus, and I immediately called an ambulance, and had the patient removed to the Woman's Hospital, where Dr. H. M. Richter operated, doing an abdominal hysterectomy.

Before the removal of the uterus he incised the walls, ascertaining that the gangrenous condition of the mucosa extended quite to the serosa through the entire thickness of the uterus, covering an area several inches in diameter. Upon opening the abdomen, the ovaries and tubes were found lying within the inverted uterus.

The operation was done expeditiously, and the patient returned to bed in good condition. The gangrenous organ was examined by Dr. Henry T. Byford, who concluded no other treatment than a hysterectomy was advisable. The patient reacted fairly well, but developed symptoms of acute septicæmia and died on the morning of the 25th. A post mortem examination revealed a small mural abscess in the abdominal wall, extraperitoneal, containing ill-smelling purulent fluid. There was no infection of the peritoneal cavity, the intestines being smooth and glistening. Perfect closure of the uterine stump without any evidence of infection. A small quantity of serous fluid found in the abdominal cavity near the spleen. Portions of the heart, liver, kidneys, spleen, and abdominal wall were taken for microscopic and pathological examination.

Dr. Richter will furnish a report of the result of

these examinations. The specimen is herewith presented for your examination.

Pathological Report, by Dr. H. M. Richter.

For assistance in studying the specimen I am indebted to Dr. F. R. Zeit.

The uterus was of about the normal size for a full-term organ, but completely inverted, presenting the mucosa externally. It was very dark, apparently gangrenous, over the greater part of the presenting fundus, of an extremely foul odor (colon bacillus). The peritoneal surface was little altered, presenting no exudate.

Microscopically, the uterine wall shows marked œdema; engorged blood vessels with hæmorrhages; extensive purulent infiltration, most marked on the mucosa side of the muscularis, but extending to the peritoneum; extensive necrosis everywhere, down to the peritoneum. Everywhere, also, the tissues are packed with colon bacilli.

The changes are probably of two-fold origin; circulatory and infective, the latter, a colon bacillus infection, being grafted upon the uterus, whose return circulation was interfered with.

Report of an Enormous Fibroid of Right Broad Ligament.

Patient, Mrs. M. R., of Rantoul, Illinois, was referred to me by Dr. Brewer with the following history:

Married; age 43; mother of two children; enjoyed good health until February, 1907, when she noticed that the abdomen began gradually to enlarge. The enlargement was first noticeable on the left side. In two or three months it was symmetrical — a uniform enlargement, filling the abdomen from below upwards. There was no marked change in her menstruation, which continued regular, but a little more profuse than usual. During May she suffered considerable pain in the abdomen. In October the enlargement was so great as to cause so much discomfort that she decided to seek relief through an operation. November 6th she entered the Woman's Hospital in my service, and presented the appearance of a woman at full term. The abdomen was uniformly enlarged, was very tense, somewhat irregular in form, and presented the appearance of a very large multilocular ovarian cyst. She was seen in consultation by Dr. Henry T. Byford, who concurred in the diagnosis.

November 8th, at 8:30 A. M., I performed a laparotomy, removing the tumor, which was found to be a very large fibroma, developing in the right broad ligament, and undergoing myxomatous degeneration. The uterus contained three small subperitoneal fibroids that were removed at the same time.

The patient recovered promptly from the operation, leaving the hospital on the 19th day, entirely recovered.

The pathological examination of the tumor was made by Dr. Jean M. Cook of the Pathological Laboratory of the College of Physicians and Surgeons, and the report is as follows:

Report of Examination of Broad Ligament Tumor, November 14, 1907.

Fixing general formalin imbedded in paraffin, stained hematoxylon and eosin. The tumor mass weighs 20 pounds; is ovoid in shape; has a very dense capsule. The ovary is attached to one side of the growth, but is not a part of the tumor. The ovary is cystic; very small cysts attached to the tumor, some of which contain mucilaginous substance. Microscopical sections of the growth show it to be a fibroma, which is undergoing myxomatous degeneration in many directions. Sections were made from various parts of the growth and no evidences of malignancy could be found. The bundles of fibrous tissue in the tumor run quite regularly, and in no place seem to be very dense, showing a rather rapid growth.

Diagnosis: Soft fibroma of the right broad ligament, with myxomatous degeneration.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

JOHN B. MURPHY, M. D.
FREDERIC A. BESLEY, M. D.
E. WYLLYS ANDREWS, M. D.
WM. R. CUBBINS, M. D.

EPULIS AND THE RESULTS OF ITS TREATMENT. By Dr. R. Kühner, from the Tübingen Clinic, Prof. von Bruns, Director.

Kühner reports 90 cases from the records of the Tübingen Clinic, occurring between 1870 and 1905. Of these 31 were microscopically examined, the findings being as follows:

Giant cell sarcoma	20
Spindle cell sarcoma	2
Fibro-sarcoma	4
Fibroma	2
Osteo-fibro-sarcoma	1
Osteoma	1
Granuloma	1
Total	31

Influence of sex. Of the 90 cases, 57 or 63.31 per cent were in women, and 33, or 30.71 per cent, in men. This comparison agrees with the quoted statistics of other authors.

Age. Average age of all 90 cases, 26 years and 4 months. Of the men alone, 18 years. The women alone, 31 years.

Localization. The lower jaw, 42 cases. The upper jaw 36 cases. Upper and lower, 1 case. As to which side of the jaw, of 49 cases in which definite note as to this existed, 29 were of the left side, and 20 on the right.

Causation. 1. Irritation, as at bad teeth, is noted as a probable predisposing cause.

2. Lack of care of the mouth. Practically constant in the reported cases, which all came from the lower classes.

3. Tobacco has been noted by some authors. Kühner points out, however, that it is much more frequent in women, and inclines to doubt the tobacco hypothesis.

4. Pregnancy seems to have an influence.

Clinical Course. Of 54 cases, the average duration was 14.5 months.

Growth is somewhat faster in patients in the first two decades, as in older ones. In women the growth tends to be slower than in men.

In none of the cases but one was a general sarcomatosis present.

Treatment. 1. In 79 of the reported cases operation was done. Operation, excepting a few of the early cases, was radical, and included removal of part of the alveolar process.

2. Of the 90 cases, 11 have had recurrences.

3. Of the 4 non-operated cases the following is noted:

One died of general sarcomatosis. Another died in three years of the epulis, which grew constantly larger.

A third died of hemorrhage originating in the epulis.

The fourth, a boy of 5 years, had a spontaneous recovery.

Results. 77 cases of the 79 (97.47 per cent) are permanently cured. Two of these had to be operated a second time.

Kühner states, in conclusion, that epulis, when radically operated, almost always recovers. When not operated, or operated in an incomplete manner, recurrences may readily occur, and as a rule cause death.—*Über die Epulis und die Resultate ihrer Behandlung. Beiträge zur Klinischen Chirurgie,* vol. 55. W. C. DANFORTH, M. D.

THE RESULTS OF EXPERIMENTAL CANCER RESEARCH.

Joannovics considers, first, the etiological connection of the various micro-organisms heretofore described, and comes to the conclusion that all are proved to be of no causative value, with the possible exception of some recently reported spirochetes. These, he thinks, may be proven to be the cause of that group of tumors and diseases ranging from lymphosarcoma to leukemia.

In the attempt to find the cause of tumors by the study of their development and structure, he calls attention to the fact that those structures which are best able to regenerate form the most frequent constituents of tumors, and that the transition from a chronic inflammation to neoplastic growth often

occurs. In the transplantation of tumors from one animal to another (mice are generally used), it has been proven that the tumor developing often does not assume the same histological characteristics as the primary growth, and that, in fact, a pure carcinoma may, in a series of transplantations, result from a primary sarcoma, and vice versa. Cachexia and ulceration are not clinical symptoms of the mouse tumor. Another peculiarity is that the tumors of the Copenhagen breed of mice cannot be transplanted in the Berlin breed, but after the Berlin breed has lived for some time in Copenhagen, then they are susceptible to transplantation. The Berlin mice are especially susceptible to sarcoma; those in Copenhagen to carcinoma.

The resistance of one breed or kind of animal to transplantation of tumors from another leads to the assumption of an hereditary predisposition, and he calls the attention to the fact that certain races are especially subject to certain forms of tumor growth.

It has been impossible, up to the present time, to make a second transplantation of a tumor grown in an animal in which the primary transplantation had been successful. This also agrees with the fact that we practically never encounter two tumors of the same apparent age in different organs of the same individual. The susceptibility of the animals seems to increase with repeated transplantation in the same breed, but at the same time the serum contains protective bodies which are inhibitive, both to sarcoma and carcinoma, and give rise to the idea that the cause of both may be the same. It has only, so far, been possible to transplant tumors where the living cells were transplanted: all attempts to cause the formation of a new growth by the injection of the tumor serums have proved impossible.

The author agrees with Ehrlich and Apolant, that malignancy is the expression of growth energy, as is shown by the fact that a carcinoma can be reduced to an adenoma, and by the effects of physical and chemical influences. Colmheim's theory of embryonal inclusions is disproved by the discovery in cancer of a heterolytic ferment, and the existence of peculiar albumin bodies, which are not affected by pepsin, but by papayotin, trypsin, and rennet. The author thinks that chemical reaction will eventually solve the problem of tumor therapy. —*Wiener klin, Wchnschr.*, 1908, No. 1.

C. G. Grulee.

Experiences with the Iodoform Bone-plug of von Mosetig-Moorhof. By Dr. Meurers, from the Louise Hospital in Aix la Chapelle.

Meurers reports 45 cases from the surgical service of Prof. Moswedel. Of these 9 were osteomyelitis, 1 bone syphilis and 35 tuberculosis. Of the tubercular cases, 14 were bone tuberculosis only, while 21 were of bone and joint tuberculosis combined.

The age of the patients ranged from 1 to 60 years, most of them being under 20.

In almost every case no toxic symptoms followed. In 2 cases only were temperature, rapid pulse, vomiting, headache and delirium noted. In these cases the following formula acted admirably as an antidote:

Ac. sulfanil.	5.0
Natr. bicarb.	2.5
Ag. Dest.	200.0

Tablespoonful every 1 to 2 hours.

In most cases 30 to 40 gms. of bone-plug were used, one case requiring 150 gms.

In almost all cases, iodin was detected in the urine one-half to three-fourths hours after operation. This reaction was usually found also 4 to 6 months after leaving the hospital, proving that the absorption must be a very gradual one, this deduction being also strengthened by the X-ray.

In the 9 cases of osteomyeletis, 6 successes and 3 failures are recorded.

Of the 14 cases of bone tuberculosis, 1 failure, 12 cures, of which 8 were by primary intention, 4 with some plug destruction, and 1 patient dying of some intercurrent disease.

Of 21 cases of joint and bone-tuberculosis, 15 cures (13 by primary union and 2 with some loss by plug), 5 failures, and 1 case still under treatment.

One case of syphilis of bone, cured.

Summed up, this gives 34 cures (25 by primary intention and 9 with slight loss of plug material) out of 45 cases.

It was found in general that best results followed when the bone was as much as possible surrounded by a bony wall, so as to protect the plug from trauma.

The technique as noted by Meurers does not differ from that already described in standard works. Stress is laid upon careful drying of the cavity.

His conclusions are as follows:

1. The method of Mosetig-Moorhof provides a very valuable way of quickly curing bone defects.

2. It is particularly adapted to the filling of tubercular cavities, in osteal processes, with or without synchronous joint involvement.

3. In cases of joint resection it provides a very conservative method of procedure, as it is, as a rule, sufficient to remove a thin cartilage layer, the deeper-lying lesions in the bone ends being

scraped out and plugged. Filling of the joint cavity in knee and elbow-resections is not recommended.

4. In osteomyelitic bone defects it is recommended to use the method only in the chronic stage. In cases which are still suppurating freely, open tamponade for several days of the cavity, previously carefully laid open and cleansed, is advised. —*Esfahsungen uber die Jodoform-Knockenplombe noch V. Mosetig-Moorhof. Beiträge zur Klinischen Chirurgie.* W. C. DANFORTH, M.D.

THE PERITONEUM IN ABDOMINAL SURGERY. By O. Pankow.

After exhaustively discussing the question of the care of denuded surfaces in abdominal surgery, with a number of tables and detailed reports of laboratory experiments, Pankow's conclusions are interesting. Scarification of the parietal or visceral peritoneum, without hemorrhage into the abdominal cavity, leads generally to a smooth healing over the abraided surface. Adhesions are produced only in exceptional cases, as in a unilateral superficial wound of the visceral or parietal serosa. Injury of the parietal peritoneum sufficient to produce a diffuse punctate hemorrhage, as is found essential in laparotomy work, leads comparatively often to adhesions. In experiments upon animals healthy peritoneum offered a higher protection against infection than where a simple wound had been made or where the thermo-cautery or absolute alcohol had been employed. In simple wounds, where the peritoneum was otherwise normal, infectious conditions were most unfavorable towards these animals. In infections of the abdominal cavity adhesions were the exception. In order to estimate the value of these animal experiments, as applied clinically, Pankow thinks that, where it is not possible to cover a diffusely oozing surface with peritoneum, the thermo-cautery, absolute alcohol, or perhaps other means of scarification, may be employed in order to overcome as far as possible the danger of infection and adhesion formation.— *Zur Frage der peritonealen Wundbehandlung. Monatssch. f. Geb. u. Gynäk.* bd. xxvi, heft 2, 1907. CAREY CULBERTSON.

ANURIA ASSOCIATION WITH PELVIC ABSCESS.

Von Khautz reports a case of anuria, accompanying an abscess in the pouch of Douglas, which followed an appendicitis. The abscess was opened through a rectal incision and drained. During the night following the operation, the patient passed a litre of clear, highly-concentrated urine. He regards the anuria as due to the pressure of the abscess on the ureters, and probably in part to in- [illegible] *Wiener klin. Wchnschr.*, 1907, No. 50.

CONTRIBUTION TO THE SURGICAL TREATMENT OF ULCUS VENTRICULI. Nord. Med. Ark. (Northern Medical Record.) 1907 Sfd. I. No. 3. Einar Key.

The author has put on record the operations performed by professors Berg and Akerman, of Stockholm, for ulcus ventriculi, and made an after-examination of the patients operated. From 1894 to close of 1906, 177 cases were operated. During period, 1894–1900, there were 64 cases that rendered operations necessary, 69 being performed, while in 1901–1906, the corresponding figures are 113–142. Some of these operations were performed on patients from the first seven years' period, who returned owing to complications arising. Most of them had undergone very lengthy and repeated medical treatment; only in relatively few cases had surgical treatment immediately been adopted, owing to the patient having no prospect of improvement from medicinal remedies.

The mortality following an operation has decreased from 15.9 per cent during the period, 1894 to 1900, to 9.8 per cent in the years, 1901 to 1906. If the percentage be calculated per number of patients, the figures are respectively 17.5 and 12.3. All in all, 211 operations have been performed, with a mortality of 11.8 per cent. Calculated on the number of cases, the mortality is 14.1 per cent. Mortality subsequent to gastro-enterostomy has decreased from 8.8 per cent in 45 cases, in 1894 to 1900, to 1.5 per cent of 66 patients operated from 1901 to 1906.

Prior to 1901 but seven resections were undertaken, the mortality being 42.8 per cent; during 1901 to 1906, eighteen resections were performed, the mortality being 16.6 per cent.

Since 1897, every effort has been made to perform operations with the smallest possible quantity of the narcotic. Chloroform has formed the usual anæsthetic. During the actual working on the ventricle, the patient has, as a rule, been allowed to awaken, since this is not painful so long as dragging and tension can be avoided. If anæsthetist duly follows the course of the operation, and is aware which parts of the proceedings causes pain, he can give small quantities of the narcotic in proper time.

Circulus vitiosus occurred in 8 cases, in each instance subsequent to posterior gastroenterostomy, that had been performed with loops 30 to 40 centimetres in length. Deducting those cases where enteroanastomose or Y-shaped gastroenterostomy

was primarily performed, circulus vitiosus has arisen in 8 instances of the 88 posterior cases, but in no single instance of the 21 cases of anterior gastroenterostomy. In the anterior gastroenterostomies, the supplying loop was attached to the ventricle by a few sutures, which was not the case with the posterior cases. The author recommends the use of a short loop in posterior gastroenterostomy. The importance of early enteroanastomosis is strongly urged, when rinsing out the stomach is found of no avail for circulus vitiosus.

The internal incarceration of loops of the small intestine, in bursa omentalis, occurred in one case of posterior gastroenterostomy. This incarceration was obviated by a new operation. Since that time, the aperture in mesocolon transversum is carefully closed by sutures to the ventricle or intestine, when performing posterior gastroenterostomy. Contraction of the gastroenterostomic aperture has been observed in 2 cases. In these cases, the contraction was probably induced by a peptic ulcer, in or adjacent to the anastomotic edge, which had healed with shrinking cicatrization. Other reasons that might contribute to such contraction are also reported. In two cases constriction ensued in the jejunal loop used in gastroenterostomy, owing to a chronic adhesive peritonitis, that caused the formation of plications in the intestine, rendering relaparotomy necessary. In one instance, a similar alteration was observed when section was made of a case complicated in other respects. The possibility is urged that in the first two cases, one or several ulcera peptica jejuni caused the chronic peritonitis. Subsequent to the healing of the wound, the adherences have shrunk and caused the plication of the intestine. No fewer than 5 cases of ulcus peptic. jejuni have been operated. In two instances, however, the first gastroenterostomy was performed at another hospital. Detailed accounts of these cases as also of the epicrises, are given. Moreover, an interesting case of ulcus peptic. jejuni, operated upon by Professor Lennander, subsequent to an operation (Billroth II) for cancer ventriculi, is described. From medical literature, the author has collected 49 cases of ulcus peptic. jejuni, and gives an account of the occurrence and prevalence of this disease. It is remarkable that in those cases where the ulcer has appeared at the earliest period, it has been localized to the jejunum. It would have appeared far more likely that the earlier ulceration would arise in the suture itself. It is probable that in some instances, when peptic ulcers have occurred immediately after the operation, at the point of anastomosis, the complication arising has been deemed due to faulty suture.

Tiegel's division of cases of ulcus peptic. jejuni into but two groups, either as those of completely devoid of symptoms, that later perforate the abdominal cavity, or as those that run a chronic course, forming adherences and ulcerous tumours, will not bear scrutiny. In some cases, where perforation has occured into the free abdominal cavity, stomachic troubles have previously been present for some time. It is, moreover, very probable that many such ulcers cause no appreciable symptoms, or give no pain; heal, and thus are never subjected to diagnosis. There are also ulcers that cause some stomachic pain, but never perforate, though occasioning an adhesive peritonitis. Subsequently, by its shrinking, it may cause stenos of the gastroenterostomic aperture, or plication of the jejunal loops.

Ulcus peptic. jejuni chiefly occurs in cases where gastroenterostomy has been performed for non-malignant gastric troubles, but may follow an operation for cancer. Anterior gastroenterostomy seems to predispose for ulcus peptic. jejuni far more than the posterior. Whether the Y-shaped gastroenterostomy or enteroanastomosis increases the risk, as regards the occurrence of ulcus peptic. jejuni, cannot at present be decided. Gastroenterotomia fundosa is not an absolute preventive against ulcus peptic. jejuni. As regards adherences around the place of gastroenterostomy, loosening them should not be deemed sufficient, but attempts should be made to discover whether they be caused or complicated by ulcus peptic. jejuni, in which case the latter must be attacked. In order to provide against ulcus peptic. jejuni, it is necessary to proceed with the operation so cautiously that the vitality and resisting power of the tissue be depressed in smallest degree compatible with the operation, after which the patient should be subjected to strict medical dietetic treatment; be kept under observation for some time, and receive skilful care, should pains recur.

When judging the methods practised by the various operators, the author lays special stress on particular attention being paid, not only to the pathological anatomical character of the ulcer, but also to its localization, complications, and patient's state consequent on the operation. In accordance with these views, the author has distributed his cases in various groups, in each group studying not only the risk of the various methods of operating, but also the primary effect and more remote results. First are discussed the operations for stenosis in the pylorus, after the ulcus is healed, and for ulcus pyloris. Experience is not favorable

as regards pyloroplasty. As a rule, it is stated that the immediate effect of this operation is satisfactory, but a relapse often occurs later on. In most cases, in the aforesaid casualty record, the immediate result of the operation has not been satisfactory. The question of resection, or gastroenterostomy, is intimately connected with the question of secondary cancerous formations in ulcus, ventriculi or ulcus cicatrices, since this danger is one of the most important reasons for a radical procedure. The author reviews the different opinions concerning cancerous degeneration of ulcer of the stomach, declaring that further investigations are necessary for the elucidation of this question. Ulcus and cicatrices, in or close to the pylorus, mostly predispose for secondary cancer, in consequence of the irritation of the contents of the ventricle being greatest just here. Ulcus and cicatrices, that are in or close to the stenosis of the "hour-glass stomach" appear to be on a par in this respect. When operating, we cannot invariably decide whether there is a malignant degeneration. Secondary cancer can arise in an ulcer or cicatrice in spite of palliative operation. Statements concerning the frequency of secondary cancer vary very considerably. At present, it cannot be determined, with any certainty, by which operation — gastroenterostomy or resection — we may save most patients in the long run. However, it does seem that the increased risk of pylorus resection, in comparison to gastroenterostomy, in general, would be counterbalanced by the greater prospect of the patient escaping secondary cancer. Resection is, however, not justifiable when but the slightest doubt is felt as to whether the patient can stand the far more debilitating resection. If cancerous degeneration be suspected, resection ought naturally to follow, if the tumor can be resected, and the patient be deemed likely to recover. Should there be an ulcerous tumour, as a rule, the operation should be limited to gastroenterostomy, eventually combined with exclusio pylori. For ulcers or cicatrices in the ventricle, close to the pylorus, the same indications hold good.

By investigations, carried on with the aid of Röentgen Rays, about the effect of the various operative methods on the voiding of the ventricle in unchanged pylorus, or stenosis of the pylorus, as also in differing form and position of the ventricle, in combination with investigations of the conversion of matter and the secretions of the gastric juice, we ought to obtain new and important facts by which we can judge the value of the various methods of operation.

In those ulcers that are cardially situated, as regards the pylorus, and are non-penetrating, with simultaneous motorial insufficiency, gastroenterostomy is advanced as the chief method. The danger of secondary cancerous formations in these ulcers appears to be less than in those in or near the pylorus, thus forming a less weighty reason for resection. As a matter of course, should there be the slightest suspicion of cancer, resection should be performed, in case the tumor can be operated, and the patient's strength justifies the operation. If the ulcers be on the anterior wall they appear to predispose to perforation, and should be extirpated where such excision be possible. With those ulcers that are cardially situated, as regards the pylorus, and accompanied with motorial insufficiency, there is far more prospect of a palliative operation conducing to the healing of the ulcer, than if the ventricle can be voided normally. Owing to the uncertain effect of the palliative operations in these cases, the indications for resection should be made rather more ample than in the cases of open ulcers, where motorial insufficiency is also experienced. For those callous ulcers penetrating the anterior wall of the abdomen resection must be deemed the normal method. Should resection be impossible, or the patient be considered unable to stand so trying an operation, then gastroenterostomy should be performed, being then combined with jejunostomy. With regard to the ulcers penetrating the pancreas or liver, it is pointed out that there is, as yet, an insufficient number of any large series of closely studied cases that have been studied for any length of time, so that no decision can be definitely made concerning the value of the various methods of operating. It seems, however, that preference should be given to gastroenterostomy, in consequence of experience hitherto obtained, especially in those cases that are combined with retention. In bad cases, this operation might be combined with jejunostomy. For "hour-glass" stomach, with short stenosis and normal ventricle wall, there may be a question of gastroplastics. If the stenosis be long and constricted, or should there be adhesive peritonitis around it, then indications point to gastroanastomosis. If, simultaneously, pylorus stenosis, or great dilation of the pylorus part, occur, one of these operations should be combined with gastroenterostomy (or possibly pyloroplastics or plyorostomy). In cases of dilation of the cardiac portion, either gastroanastomosis or gastroenterostomy of the cardiac portion should be performed. Open ulcers should be operated by gastroenterostomy on the cardiac portions, or by gastroanastomosis in combination with gastroenterostomy, preferably of the cardiac portions.

In suitable cases resection may be performed. If there be any suspicion of malign degeneration of the ulcer, resection should, if possible, be undertaken. For duodenal ulcers, gastroenterostomy is advocated, combined with exclusio pylori. If the ulcers have attacked the pylorus, and still more so if they extend to antrum pylori, then owing to the risk of secondary cancerous degeneration, there are the same indicants for resection as in primary ulcer in the pylorus or antrum pylori.

By localized adherences, gastrolysis is indicated. In such cases, a gastroenterostomy should also be performed, as there is danger of adherences again forming. In those cases where they fix the pylorus, or upper part of the duodenum, to the liver, simple gastroenterostomy is often of good effect. Even should lysis be performed in these cases, yet gastroenterostomy should follow, since the adherences easily form again. With extended adherences, the prognosis for gastrolysis is not favorable. Should the adherences hinder the due evacuation of the ventricle, there seems every prospect of a satisfactory result being obtained by gastroenterostomy. Where possible, gastrolysis should be combined with gastroenterostomy.

In cases of perforation peritonitis, the first consideration must invariably be to conquer the peritonitis, and the operation be performed as quickly as possible on the usually sadly debilitated patient. If the sore can stand direct suture, this should, as a rule, be performed, in preference to excision, which complicates the operation. Should no stenos be found, and no constriction arise from the sewing together of the wound, it is better not to perform gastroenterostomy, in order that the operation may not be unduly lengthened. Jejunostomy appears to be more called for in these cases. A secondary gastroenterostomy is not invariably necessary. In five cases, after careful and systematic flushing of the abdominal cavity with a saline solution, from a median incision, after due suture of the aperture of perforation, the abdominal cavity was closed with the exception of a small gauze packing, towards the ventricle suture. To state a certain maximal time, within which the abdominal cavity can be completely closed, is utterly impossible, since the malignancy of the peritonitis does not solely depend on the lapse of time between the perforation and the operation. It is safest to place a packing towards the ventricle ulcer, especially if excision be not performed.

The author reminds us that the medical and surgical treatment ought not to be two methods that compete with each other, but that they should supplement each other in such manner that surgical treatment was employed when medical treatment appeared hopeless in those cases from the very beginning, or had proved unable to attain its aim. He, moreover, lays stress on ulcers in or adjacent to the pylorus, as also ulcers in the duodenum, needing wider indicants for operation than other localization of ulcers in the ventricle. Should there be symptoms of an open ulcer, with retention, operative measures should be adopted far sooner than when no such symptoms are discoverable.

Subcutaneous Muscle-rupture and its Operative Treatment. By Dr. W. Wolf, from the Leipzig Surgical Clinic — Prof. Trendelenburg, Director.

Wolf reports four cases of muscular rupture seen in the Leipzig clinic and collects 20 cases from the literature. Three of the reported cases were of the biceps and one of the quadriceps femoris.

Etiology.— 1. Type of force. The great majority of cases follow indirect violence, as, a severe muscular effort.

2. Muscular men are most often affected. But two cases have ever been reported in women. In one of these a tumor of the upper arm had previously been removed.

3. Previous diseases. Acute infections, such as typhoid, variola, scarlatina, miliary tuberculosis, syphilis, and alcoholism seem to play a part.

Diagnosis — When no great effusion of blood is present, usually not difficult.

1. Loss of function. In some cases of biceps rupture it is not particularly marked.

2. Deformity. In the muscle belly, the ruptured ends may stand out and leave a hollow between them. On the other hand, near the tendon, the torn muscle may stand out as a more or less spherical tumor mass.

3. In some cases a hematoma may so mask the deformity that it is not noticeable, and the injury may be taken for a simple contusion.

Location — 1. Biceps. The long head of the biceps is much more frequently injured than the short. In one reported case both heads were torn.

2. Quadriceps. Of 64 cases from the literature, 34 were pure tendon ruptures; 8 were pure muscular ruptures.

Treatment. These cases were all formerly treated conservatively, fixation in the flexed position, pressure by adhesive plaster and bandages; later, massage, electricity action and passive motion.

2. Wolf is of the opinion that an attempt should in most cases be made to unite the torn surfaces by suture. Of the 20 quoted cases, 13 were oper-

atively treated, with good results. Of the 4 cases from his own clinic, 2 were operated, the result in both operated cases being extremely good. — *Zur Kenutnis der Subkutanen Muskelruptur und ihres Operativen Behandlung. Beitrage zur Klinischen Chirurgie.* Vol. 55.

W. C. Danforth, M. D.

The Diagnosis of Arterial Closure in Gangrene of the Foot. By A. Moszkowicz.

There is a great difference of opinion among surgeons to-day as regards the site of election for amputation in gangrene of the lower extremity. Some advocate amputation through the thigh, whereas others recommend merely the removal of the foot. This difference of opinion is due to the fact that we possess no means of establishing at what level the vessels of the leg are in a healthy state. In order to determine the state of the vessels, Moszkowicz recommends that the affected leg be rendered bloodless by means of an Esmarch bandage, and that the bandage then be suddenly removed. In a healthy leg sudden removal of this sort is followed by an active red hyperemia extending to the tip of the toes, whereas, if the vessels are diseased, the hyperemia occurs more slowly and usually extends only as far as that point where the vessels are in good condition. Moszkowicz quotes three cases in which amputated legs were studied with the result that the preoperative diagnosis was absolutely confirmed, the point of obstruction being found to exist at that spot beyond which no hyperemia occurred after the release of the Esmarch.—*Mitt. a. d. Grenz. d. Med. u. Chir.*, b. xvii, h. 1 and 2.

M. G. Seelig, M.D.

Transplantation of Fresh Kidney Tissue. By H. V. Haberer.

In this extensive piece of work, done at the suggestion of Prof. von Eiselsberg, Haberer has made use of over thirty-five animals, in each case transplanting a portion of freshly removed kidney-parenchyma into the liver, spleen or omentum. As a result of these various experiments Haberer found that when kidney tissue is transplanted in spleen, omentum or liver, it heals in situ without any reactionary inflammation. After a time, however, the transplanted pieces undergo necrosis, are absorbed and supplanted by scar tissue. During this time, however, a portion of the transplanted tissue may show reparative phenomena, as manifested by nuclear division. The kidney function of the animal is in no way influenced by the transplantation.— *Arch. f. Chir.*, b. lxxxiv, h. 1.

M. G. Seelig, M.D.

Intraperitoneal Injection of Oxygen for Tuberculous Ascites. By Karl Schulze.

Schulze recommends that in cases of ascites due to peritoneal tuberculosis the ascitic fluid be evacuated through a trocar, and that oxygen gas be led into the peritoneal cavity through this same trocar. Enough oxygen is allowed to enter the abdomen to distend it to the same degree that it was distended by the fluid previously removed. As a general rule this means the admission of about 1,500 ccm. of the gas. Patients undergo the procedure uncomplainingly, and aside from an occasional vomiting spell no untoward symptoms were noticed. Of course there is always a more or less well developed meteorismus, but this seldom lasts longer than eight to ten hours. The temperature curve is not noticeably influenced. A short while after the injection the ascitic fluid begins to be absorbed, and only occasionally (once in seven cases) is a repetition of the injection necessary. The results so far are highly satisfactory, although the number of cases treated up to the present is small.—*Mitt. a. d. Grenz. d. Med. u. Chir.*, b. xviii, h. 1.

M. G. Seelig, M.D.

Further Experiences with Physostigmin Injected Subcutaneously to Stimulate Peristalsis. By Vogel.

One of the most powerful aids in preventing peritoneal adhesions after laparotomy is the early stimulation of peristalsis. As a rule the ordinary cathartics fail to do this, owing to the fact that they cause vomiting when administered soon after an anæsthetic. For this reason it is very desirable that some drug should be used that can be administered subcutaneously. Vogel has used physostigmin in a large number of cases immediately after operation, and since using the drug has not encountered a case of post-operative ileus. He cites in particular three cases in which conditions were such that there was every reason to expect post-operative ileus, in which cases, however, the post-operative course was uneventful. The drug has served excellently in quite a number of cases of meteorism following contusions of the trunk. Vogel quotes six such cases. The drug is administered in a 1 mg. dose, followed after an hour by a glycerin enema. After five or six hours both the physostigmin and the enema may be repeated. The author warns very distinctly against too severe and too prolonged catharsis before operation. He believes merely in the administration of a dose of castor oil one or two days preceding the operation.— *Mitt. a. d. Grenz. d. Med. u. Chir.*, b. xvii, h. 5.

M. G. Seelig, M.D.

THE SPONTANEOUS HERNIAS OF THE LINEA SEMILUNARIS. By L. Thévenot and Gabourd.

The term ventral hernia is too comprehensive. It lacks definiteness. Hernias which formerly were discussed as ventral hernias are now being discussed under separate headings, viz: Hernias of the linea alba, of the linea semilunaris, etc. Under the title of hernia of the linea semilunaris are designated all hernias that escape through aponeurotic space extending between the outer border of the rectus abdominalis and the line of insertion of the muscular fibers of the transversalis. Some of these ventral hernias are traumatic. As examples of these may be mentioned hernias following perforating wounds of the abdomen, operative wounds of the abdominal wall inflicted for the removal of the appendix, for the draining of a deep abscess, for the ablation of a parietal lipoma. Other hernias are spontaneous in origin. Unlike the former, their site is constant. Hernias of the spontaneous type are the only ones that are considered in this article.

Klinklosch, in 1764, first described hernias of the linea semilunaris, Cooper in 1837 reported 3 cases. He was the first to call attention to the fact that numerous small vessels pass through the abdominal wall in this region, and that the muscular fibers may be somewhat separated around these vessels so that the gap in the wall is already formed.

Etiology. All causes susceptible of producing hernia elsewhere can produce it in this location. These hernias have a constant seat, which is external to the outer border of the rectus, on an imaginary line extending from the umbilicus to the anterior superior spine. The constancy of their seat suggests an anatomic predisposition.

The authors examined the abdominal wall of 10 cadavers so as to determine the exact course of the deep epigastric artery. The distribution of this artery is of two types. In the first type, which is the more frequent, the artery curves upwards and inwards, to about the middle of the posterior surface of the rectus, behind which surface it courses upwards. The less common type was found four times. In these cases, the artery near the semilunar fold of Douglas, courses along the outer border of the rectus. It gives off a perforating branch below the semilunar fold of Douglas. This branch is constant and perforates the aponeurosis, the linea semilunaris principally, creating an orifice which under normal conditions may have a diameter of 4 mm. This orifice is situated upon a line extending from the umbilicus to the anterior superior iliac spine, immediately external to the rectus abdominalis muscle, at the point where, clinically, we find hernias of the linea semilunaris.

These hernias may be congenital. Among other causes may be mentioned adiposity, pregnancy (almost all the cases of hernias of linea semilunaris reported have occurred in women), abdominal tumors, ascites, phlegmon of the abdominal wall, congenital weakness of the tissues, properitoneal lipomata.

Pathology. The volume of these hernias is variable. Their number varies. Usually, they are single. They may exist with other types of hernia. Their seat is constant, being found at that point of the linea semilunaris where it is crossed by a line extending from the umbilicus to the anterior superior spine of the ilium. The ring is formed by the aponeurosis of the internal oblique and the transversalis muscles. The hernia may be simple, properitoneal or interstitial. A hernial sac is always present. The contents may be caecum, colon, small intestines, epiploön, etc. The contents may be free in the sac, may become adherent to it. The hernia may become irreducible, inflamed, obstructed, strangulated. Gut may be kinked, twisted, compressed by bands.

Diagnosis. Vague dyspeptic symptoms; a mass may be palpable. Reduction is not always associated with gurgling. Often the hernia is found only at autopsy-table. The location of the hernia helps to make a precise diagnosis. Enterocolitis, cholecystitis, appendicitis, and sigmoiditis must be excluded.

In young patients a radical cure is imperative. The ring, when not large, is easily obliterated. In some cases, the obliteration of the ring is very difficult. Recurrences occur. In old, obese individuals with myocarditis and chronic bronchitis, in absence of marked pains, in absence of irreducibility and strangulation, it is better not to operate and to be satisfied with the wearing of a truss. Cases are reported in detail,— *Les Hernies Spontanées du repli semi-lunaire de Spiegel. Revue de Chirurgie*, Paris, vol. xxvii, No. IV, 1907.

AIMÉ PAUL HEINECK.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF OBSTETRICS

UNDER THE CHARGE OF

C. S. Bacon, M. D. Rudolph W. Holmes, M. D.
C. v. Bachellé, M. D. Hugo Ehrenfest, M. D.

Compression of the Aorta for Post-partum Hemorrhage. By F. Percy Elliott.

Elliott reports the case of a tertipara, aged 22, whose previous pregnancies had been normal, except that her last child was still-born, evidently due to the cord being about the neck. In the labor here reported the pains were preceded by a sharp uterine hemorrhage. Examination revealed the lower margin of the placenta overlapping the internal os; the position of the fœtus was normal, and the mother's general condition good. The pains at first were feeble and irregular, but later became stronger and frequent. By this time, with three fingers dilatation, the hemorrhage became profuse. Delivery was now effected by version and a sharp hemorrhage followed the extraction of the child; the uterus showed inertia and the pulse rose to 140. Manual compression of the aorta stopped the bleeding and the third stage was terminated without difficulty. The woman now was faint, cold and pale, pulse 140 to 150. Under treatment she rallied for a few hours, but again bleeding set in with a return of the inertia, and she showed collapse. The uterus was emptied of blood-clots and again expression of the aorta was resorted to. Normal saline was given subcutaneously, the legs were bandaged and elevated, and ernutin administered hypodermatically. For five hours direct pressure on the aorta was maintained by Elliott and his assistant and the hemorrhage absolutely controlled. The patient, who had been unconscious, now recovered sufficiently to take nourishment. The pulse gradually fell to 100 and was of good character. The bandages were removed and her condition became quite satisfactory. During the following night, however, she was permitted to leave the bed for some water on a near-by table, fell in a collapsed state on the floor, and soon expired from heart failure.

Despite the fatal termination, Elliott regards this case as a good illustration of the great value of compression of the aorto. Bleeding had ceased for nearly fourteen hours before the patient died, and no further hemorrhage occurred at the time of death.— *Bristol Med. Chirur. Jour.*, June, 1907. Abstract from *Jour. Obst. and Gyn. of the Brit. Emp.*, vol. xii, No. 3, Sept., 1907.

Carey Culbertson.

Vaginal Cæsarean Section. By H. Rotter.

The writer reports four cases from the clinic of von Elischer, Budapest. In two cases the indication was an uncompensated mitral insufficiency, and in two, eclampsia. Albuminuria was also present in the first heart case. Both eclamptics were in coma and showed albuminuria. In the first heart case both mother and babe were lost, but all the rest lived. All four women were at term and in labor. Vaginal section was preferred as being the most rapid method of performing accouchement forcé. Rotter would confine this operation to cases where the child was living or viable, and where labor had not begun or was early in the first stage. In various case-reports he has found the operation performed for the following indications, certain of which he questions forcibly:

1. Rigidity of the cervix, as that due to ulcers or operations.
2. Carcinoma cervicis.
3. Eclampsia.
4. Vitium cordis, as in failure in compensation in valvular lesions.
5. Pulmonary tuberculosis, in an advanced stage.
6. Premature detachment of the normally implanted placenta.
7. Placenta prævia.
8. Artificial induction of premature labor.
9. Chorea.
10. Hyperemisis gravidarum.
11. Septic fever during labor.
12. Prolapse of the umbilical cord, except in contracted pelvis.
13. In prophylactic version.
14. In the moribund and dead.

Five cases of vaginal Cæsarean section were reported at the same time by Béla Nádory, also of Budapest. Three of these were for carcinoma of the cervix, in all of which the mothers and babes survived the operation, though one woman died two months later. Eclampsia was the indication in the other two cases, and here the mother was lost in the first case and the child in the second. Case Reports.— *Zentrbl. f. Gynäk.* No. 39, 1907.

Fatty Degeneration of the Uterus in Pregnancy. By Marius Ciulla.

Ciulla has studied the uterine changes due to pregnancy in Bossi's clinic at Genoa, and reaches important conclusions. He finds that in the last two months of pregnancy a true fatty degeneration exists in the uterus, which involves only the hyperplastic muscle fibres. These fibres are first destroyed and then a fatty infiltration of the hypertrophic fibres occurs, so that in this way they become reduced in volume and take on their normal morphology. At the end of pregnancy this fatty degeneration has a restraining effect on the marked irritability of the uterus, and hence, in case of excessive degeneration, a primary and essential inactivity of the uterus at this time may be explained. With a decreasing or absent degeneration, on the other hand, we observe those cases of marked contractions, particularly during labor. In like manner subinvolution and hyperinvolution in the puerperium may be explained.

In prolonged pregnancy, therefore, we may recognize an excessive or premature degeneration as the etiologic factor, just as its entire absence may lead to abortion. The author also believes from his study that, carried by the maternal blood, fat from this change in the smooth muscle fibres of the pregnant uterus may add directly to the development of the fœtus during the last two months of gestation. This is the first reserve force upon which the child may draw, the functionating breast being the second. Finally, Ciulla thinks that fat, produced in the puerperium by the active process of involution, assists materially in the secretion of milk.— *Über die fettige degeneration der Gebärmutter bei Schwangerschaft. Zentrbl. f. Gynäk.*, No. 37, 1907.

Carey Culbertson.

The Pathology of Peritonitis. By E. Heller.

Heller's contribution is a general review of new experimental research in the pathology of acute peritonitis. He considers the means by which resorption takes place in the abdominal cavity, and the occurrence of resorption and transudation in the normal and diseased peritoneum. Bacterial resorption in peritonitis and peritoneal resistance to infection are referred to, as well as a brief mention of therapeutic experiments. As regards the causes of death in peritonitis he quotes from Heinecke.

1. The cause of death in perforation peritonitis in the rabbit is a paralysis of the center in the medulla oblongata.

2. This extends in first degree to the vasomotor center; in second degree, to the respiratory center.

3. The circulation shows a marked disturbance earlier than the respiration, but the latter yields before the former.

4. Paralysis of the vasomotor center is the cause of the circulatory disturbance; this ranks first in the clinical signs.

5. The heart takes no part in this condition of the circulatory disturbance.

6. The degree of circulatory disturbance in peritonitis is exactly in proportion to the severity of the infection.

7. The paralysis of the nerve centers is the result of the entrance into the blood stream of bacterial products from the peritoneum.

In quoting from Danielsen's recent work on this subject, the writer brings out the following deductions:

1. Bacteria are carried from the abdominal cavity by the lymph streams and not by the circulation.

2. By the introduction of oil into the stomach, for the purpose of flooding the lymph channels, it is possible to check bacterial resorption. This is in line with Glimm's investigation.

3. The application of cold in delaying resorption is found to have no substantial effect, while that of heat, in order to hasten resorption by active hyperæmia, possesses an unfavorable influence on the course of the infection.

4. Attempts to explain this difference in resorption from the abdomnial cavity show that colloids are taken up by the lymph vessels and crystalloids through the blood stream.— *Bericht über neuere experimentälle Forschungen zur Pathologie der akuten Peritonitis. Monatsschr. f. Geburt. u. Gynäk.* bd. xxvi, heft 3, 1907.

Carey Culbertson.

The Function of the Mammary Gland. By H. Cramer.

The author of this article sums up the results of his observations in a single paragraph as follows:

The development of the female mammary gland depends directly upon the function of the ovary.

Physiologic and pathologic stimulation in the ovary and sexual apparatus results in a similar stimulation in the breast. As for the function of the gland, the secretion of milk, pregnancy is a preliminary condition, but the two need not necessarily be produced consecutively. Even as early as the first month this stimulation of secretion may be lost by abortion. In the last month of pregnancy there arises a check to the stimulation which continues in force until the labor is over. Then cessation of fœtal metabolism and evacuation of the uterus give the necessary impulse to secretory activity. Lactation may persist for several years, and the longer it is maintained after labor the more satisfactorily is the function of the gland brought into service again. The secretory activity is entirely independent of the ovary. Marked psychic influence may produce a primary disturbance of the breast function, shown suddenly in a considerable diminution of the secretion. This disturbance may be overcome, in turn, by putting the child to the breast.— *Einige Beobachtungen über die Funktion der weiblichen Brustdrüse. Monatssch. f. Geb. u. Gynäk.* bd. xxvi, heft 3, [illegible]

CARL G. GILBERTSON.

CASE REPORT

A Report of a Case in which the Appendix had its Origin in the Posterior Wall of the Cæcum Several Inches Above the Iliocæcal Junction

By GASTON TORRANCE, M. D.
Surgeon to St. Vincent's and The Hillman Hospitals, Birmingham, Alabama

The patient, a farmer, 57 years of age, was referred to me by Dr. H. T. McGehee of Morris, Ala., on June 25, 1907, with the following history: During the past three years he has had five attacks of appendicitis, as a rule he was confined to bed for two or three days each time and would be relieved of all symptoms as soon as his bowels were freely moved.

The patient had the typical symptons of appendicitis except that there was also a decided tenderness over the region of the gall-bladder.

Under ether an incision was made through the rectus muscle, so that it could be enlarged upward in case the gall-bladder proved to be involved. The cæcum was delivered without difficulty, but there was no evidence of an appendix or abscess behind it or anywhere in the neighborhood. I enlarged the incision downward, and only after sweeping my finger around the brim of the pelvis a number of times did I accidentally find a small tip of the appendix hanging over the brim near the rectum; when brought up and pulled upon, it was found to make a ridge in the mesentery of the ilium leading to a point several inches above the iliocæcal junction, and that it would be impossible to remove the whole appendix without making an incision through the mesentery, and as the tip was almost in a gangrenous condition this was deemed unwise. While an assistant held the ilium up as high as possible and made traction upon the

Drawing showing relations of the appendix.

appendix, I ligated it and the mesappendix with a heavy chromic catgut ligature and amputated, making no attempt to invert the stump.

A small Mikulicz drain was passed down to the stump and allowed to remain for several days. This healed up promptly. The patient is reported to be in perfect health four months after operation.

BOOK REVIEWS

PROGRESSIVE MEDICINE. Edited by Hobart Amory Hare and H. R. M. Landis. Philadelphia and New York: Lea Brothers & Co.

This volume of Progressive Medicine consists of a review of the Diseases of the Thorax and Viscera, by William Ewart; Dermatology and Syphilis, by William S. Gottheil; Obstetrics, by Edward P. Davis; and Diseases of the Nervous System, by William G. Spiller.

These well-known authors have reviewed the literature carefully, and those who are interested in these practical branches will find that the material which has appeared in the last few months previous to its appearance has been well covered by the contributors. The part by Davis is particularly extensive and satisfactory; the name of Spiller is sufficient guarantee as to the character of work done in his section.

NIERENDIAGNOSTIK UND NIERENCHIRURGIE. By G. Kapsammer. Two volumes. Vienna and Leipzig: Wilhelm Braumüller.

It is seldom that the reviewer of a book has so few chances for criticism as has one who studies Kapsammer's book with care. Prepared in a most excellent manner by Braumüller, as far as typographical work is concerned, he has brought forth two volumes, approximating in all 1000 pages, which cover the entire subject of surgery and diagnosis of kidney lesions in a most satisfactory manner. His investigations of the literature, re-enforced by his own extensive experience, make the book one which should appeal to every physician having to deal with these lesions as being by far the most complete, satisfactory, and up-to-date book which we have upon the subject.

The first volume takes up in an extensive manner the various methods of diagnosis and technical procedure. After the older methods of investigation of the urinary secretion have been covered, cryoscopy is discussed extensively and his technique described. Electric conductivity is given a brief review, while the methods of investigation by the introduction of methylene blue, indigo-carmine, phloridzin, and other materials, are discussed extensively and satisfactorily.

The method of collecting the urine from either or both kidneys is considered and the various older methods, such as the Luys and Harris segregators, are discussed, but the greatest space, of course, is allotted to catheterization of the ureters.

The book is particularly valuable on account of the extensive bibliography which accompanies the first volume.

The second volume discusses more particularly surgical phases. Tuberculosis of the kidney has received a proper share, 188 pages being given to this question, which includes, of course, case reports. The tumors of the kidneys, with the exception of hypernephroma, might have received more extensive consideration. The discussion of renal hæmaturia, however, is well worthy of the author. The chapters on nephrolithiasis which are accompanied by numerous case reports, and those upon pyonephrosis and pyelitis, are excellent. The surgery of the ureter does not receive the consideration that one might wish for.

Taken as a whole, the two volumes will be welcomed by the American public with pleasure and satisfaction, as a most valuable contribution to the subject of kidney surgery.

DISEASES OF THE SKIN. Fifth edition. Henry W. Stelwagen. Philadelphia: W. B. Saunders Company.

The fifth edition of Stelwagen's classical work on Diseases of the Skin contains considerable new matter, while retaining all the previous well-known commendatory features.

The main subject-matter bears much evidence of careful revision. Among many new minor points, the relation of the spirochæta pallida to syphilis receives judicial recognition.

Much of the new material introduced is concerned with certain tropical diseases — frambesia, verruga pernana, and tinea imbricata, — which, always fascinating, have acquired new interest from our closer relations with tropical countries.

The method of classification — modified from that of Hebra — might, we think, receive further modification with advantage in some slight respects.

We would like, for example, to see the "infectious granulomata" removed from the class of new growths. This is a minor point, however. No scheme of classification, yet devised, can, at present, be entirely satisfactory.

The wealth of photographs, half-tones and colored plates — over three hundred in number —

constitute, from an artistic standpoint alone, a most pleasing feature of the work.

The value of good illustrations of dermatological cases is, to the student, inestimable, and in this work a wise and happy choice has been shown in their selection.

The introduction of many good drawings of pathological sections of various skin diseases is an excellent and valuable feature.

In the text, this work compares most favorably with any dermatology of which we have knowledge. It is written in a broad and scholarly spirit which only an exhaustive knowledge of the subject, coupled with wide practical experience, can bestow.

The many references to current literature is not the least valuable feature. Treatment is considered in great detail and not from the standpoint of the set prescription, but with a broad view of the underlying principles.

One who desires a complete, helpful, and most judicial exposition of dermatology as it is to-day will find that this classical work leaves little to be desired.

THE TREATMENT OF FRACTURES. By Charles Locke Scudder, M.D., Surgeon to the Massachusetts General Hospital; Lecturer on Surgery in the Harvard University Medical School. Sixth edition, thoroughly revised and enlarged, with 856 illustrations. Philadelphia and London: W. B. Saunders Company. 1907.

This sixth edition of Scudder's most excellent treatise upon fractures is a volume of over 600 pages, profusely illustrated, with 856 photographs of pathological conditions and methods of treatment. There has been a very commendable increase in the successive editions in the amount of space devoted to methods of technique in the treatment of fractures. In the present edition, the author has added the later bibliography, and has amplified many of the chapters. Especially has he discussed the remote results following trauma of the head and those skull fractures occurring in the new-born. Additions have been made in the discussion of fractures of zygoma, of the malar bone, of the superior maxilla, of the head and neck of the radius, of the neck of the femur, and of the carpal scaphoid. In relation to this latter, however, he unfortunately does not lay stress upon the fact that we frequently find the scaphoid divided normally. This is particularly unfortunate, in that he leans to radical treatment of these cases, rather than more conservative methods, which most surgeons find satisfactory.

He has also discussed, more completely than in previous editions, unreduced dislocations of the elbow, dislocation of the acromio-clavicular joint, pathological fractures, old fractures of the radius, and Volkmann's contracture. The consideration of this latter subject is particularly praiseworthy, since the possibilities of injury following splints is not so widely appreciated by the general profession as it should be.

One cannot but hesitate to offer any suggestions for improvement, in a book which is such a credit to the profession. However, more extensive discussion might have been given to longitudinal fracture of the elbow, involving the ankle joint, and the open treatment of fractures.

The chapter by Codman, upon the use of Röntgen rays in the treatment of fractures, is an excellent idea, but one that might be amplified, particularly in the discussion as to the methods of securing good photographs of various bones of the body, considered in detail, and also as to the deductions to be made upon photographs which are secured, and upon the conservative treatment in cases of apparent improper reduction.

The chapter upon the employment of plaster of Paris in the various parts of the body, and the ambulatory treatment of fractures, are well conceived and carried out. The bibliography is especially valuable to the surgeon.

The publishers have produced a volume that, in every sense, is a credit, and both they and the author should be congratulated.

HOSPITAL TRAINING SCHOOL METHODS AND THE HEAD NURSE. This work will supply a much felt need for those who are responsible for the teaching and training of pupil nurses.

The author calls attention to the essentials to be kept in mind in selecting nurses; then outlines a course for their theoretical and practical work, pointing out present day evils to be found in many schools, in regard to teaching theory, that is non-essential at the sacrifice of the essential. The chapters on Dietetics and Anatomy deal especially with this. She emphasizes the necessity of demonstrating, as far as possible, all theoretical work.

To have well-trained nurses, we must provide suitable instructors: chief among these is the head nurse. The latter part of the book is devoted to her, her qualifications, duties, and responsibilities being clearly and concisely defined.

A VERY YOUNG OVUM IN SITU. By Prof. G. Leopold, Geheimer Medizinalrat, Director of the Royal Gynæcologic Clinic and School for Midwifery, Dresden. Member of the Royal Medical Board of Dresden. Comprising the Fourth Vol-

ume of the "Arbeiten aus der Frauen-Klinik in Dresden." Authorized English Translation. By W. H. Vogt, M. D., Gynæcologist and Obstetrician to the Lutheran Hospital, St. Louis, Mo. 70 pages, with 16 lithographic plates. Price, $3.50. St. Louis: C. V. Mosby Company. 1907.

This volume is a translation of the monograph describing Leopold's ovum that was published in 1906. While the original publication has already been studied by specialists interested in this particular line of research, it is undoubtedly of a certain value to have a competent translation. This Dr. Vogt has accomplished in the present work, thus bringing so important a part of Leopold's studies within the range of the general practitioner's observation. Whether this will be of essential use to the latter is, of course, another question. The translation is altogether adequate, and represents the original excellently. Particularly is this true of the plates, which are furnished by the original publisher. The only defects consist in an occasional error in proof-reading and the use of a German word or phrase, which, if not capable of translation, should be explained.

CAREY CULBERTSON.

A CLINICAL ATLAS — VARIATIONS OF THE BONES OF THE HANDS AND FEET. By Thomas Dwight, M. D., LL. D., Parkman Professor of Anatomy at the Harvard Medical School. Philadelphia and London: J. B. Lippincott Co.

This is an excellent treatise which will be found almost invaluable to those who deal with the diagnosis of fractures and injuries by means of the X-ray. The author has made a careful study of the variations noted in the hand and foot, and it is intended to be a practical as well as a scientific discussion of the subject.

It is illustrated by many photographs of the bones as well as X-ray pictures of the hand and foot, demonstrating the variations that may be found by the skiagrapher.

It is a type of book that the American surgical world would be pleased to see more of, being a monograph upon a special subject, and it is a credit both to the author and the publisher.

THE OPERATIONS OF SURGERY. By W. H. A. Jacobson, M. Ch., Oxon., F. R. C. S., Consulting Surgeon Guy's Hospital, and R. P. Rowlands, M. S., London, F. R. C. S., Assistant Surgeon and Surgeon to the Orthopedic Department, Guy's Hospital; joint teacher of Surgery in the Medical School.

In two volumes. Fifth edition. Philadelphia: P. Blakiston's Son & Co. 1908.

The friends of the last edition of this work, published six years ago, will readily recognize the present one, as there is a marked similarity in the mechanical work and the style.

The present edition is in two octavo volumes, shows an increase of 560 pages over the last, and the addition of several new and more modern illustrations.

A change is noted in the person of the joint author: Mr. F. J. Steward being supplanted by Mr. Rowlands.

The authors state that this is a work intended especially for the use of those recently appointed on a hospital staff and for those preparing for the higher examinations. The text is written in essay style, and more space is given to the discussion of indications and contraindications for, and complications and dangers of, the various operative procedures, than to the details of the operations themselves. In addition, many case records are cited and considerable attention is given to the opinions of representative men of former years, as regards surgical treatment of various conditions, showing the changes in and development of the beliefs and practices of the profession up to the present time.

Representative surgeons, of former and present times, are quoted frequently throughout the work, and the author has been kind enough to give the reference to the original paper in almost every instance.

The various operations and surgical conditions are handled from a strictly regional standpoint, that is, the various amputations, ligations, resections, etc., peculiar to a region, are described under the surgery of that region — not as a whole. When referring to the text, this is of advantage to the reader from the standpoint of surgical and regional anatomy, but is the cause of some repetition on the part of the author.

The first volume includes the operations on the upper extremity, operations on the head and neck, and operations on the thorax.

In the second volume, the author first discusses ligation of the various vessels, and then goes on to the consideration of the various types of hernia.

Considerable discussion is given in regard to the time for operation in appendicitis, both views being taken up in turn.

As regards general peritonitis, the authors are not dogmatic in their conclusions, recommending, however, drainage (rubber tube) and, in what they term "septic cases," favor irrigation.

Surgery of the kidney and ureter is handled at some length — particular attention being given to diagnosis in kidney conditions.

A chapter on gynecological operations is included in this volume.

It would seem to us that the book is one of value to the general practitioner and to the young man entering his hospital work, as it is written in conservative style and discusses at some length the various sides of the problems that may arise.

The chief fault we find in the work is that the author has made up the present edition by simply adding on to the preceding ones. The result of this procedure is that the volumes are somewhat bulky for the purpose for which they were written, and the reader is obliged to sort out the information he desires from a considerable amount of ancient history.

As a whole, the work makes rather interesting reading, and the references to the teachings of prominent surgeons of the past twenty-five years will be of use in giving the reader a review of the development of modern surgery.

The volumes are indexed both as to subjects and to authorities quoted.

The mechanical work leaves a great deal to be desired. The illustrations are, for the most part, old style woodcuts, showing, in some cases, gentlemen, wearing coat and cuffs, doing amputations, etc.

The type is, in part, rather small for comfortable reading.

A Manual of Orthopedic Surgery. By Augustus Thorndyke, M. D.

Dr. Thorndyke has prepared a manual which is concise, clearly written, and presents as many of the important details as can be brought together in a book of this size. In attempting a new classification, he has made a bold stroke that will certainly add to the clearness of the picture for the beginner and the general practitioner. Part II. is particularly instructive, and at the same time so simple that any one can grasp the principles involved, and apply the same with some degree of intelligence. The chapter on plaster, and other appliances, is also good, giving the author's experience and a comparison of the methods of other men in such a way as to leave a choice open to the student, of two or three well-recognized and thoroughly tried modes of treatment.

The book as a book, is a credit to the author and publishers; compact, fully illustrated and handsomely bound. William R. Cubbins.

BOOKS RECEIVED.

Compend of Surgery. By Orville Horwitz, B. S., M. D. Sixth edition. Philadelphia: P. Blakiston's Son & Co. 1907. Price, $1.00.

Modern Otology. The principles and Practice of Modern Otology. By John F. Barnhill, M. D. and Ernest De W. Wales, M. D. Philadelphia and London: W. B. Saunders Company, 1907. Cloth, $5.50, net; Half Morocco, $7.00, net.

Diseases of the Nose and Throat. 4th Edition. By D. Braden Kyle, M. D. Philadelphia and London: W. B. Saunders Company, 1907. Cloth, $4.00, net; Half Morocco, $5.50, net.

Atlas and Text Book of Human Anatomy. Volume III. By Prof. J. Sobotta, Wurzburg. Edited by J. Playfair McMurrich, M. D. Toronto. Philadelphia and London: W.B. Saunders Company, 1907. Cloth, $6.00, net; Half Morocco, $7.50, net.

Reference Handbook of Obstetric Nursing. By W. Reynolds Wilson, M. D. Philadelphia and London: W. B. Saunders Company, 1907. Flexible leather, $1.25, net.

Diseases of Children for Nurses. By Robert S. McCombs, M. D. Philadelphia and London: W. B. Saunders Company, 1907. Cloth, $2.00, net.

The Practical Medicine Series. Volume x. Nervous and Mental Diseases. Edited by Hugh T. Patrick, M.D. and Charles L. Mix, M.D. Series 1907. Chicago: The Year Book Publishers.

Maternity. By Henry D. Fry, M. D., Sc. D., Washington, D. C. New York and Washington: The Neal Publishing Company. Price, $1.50.

Abdominal Hernia. Its Diagnosis and Treatment. By W. B. De Garmo, M. D., New York-Philadelphia and London: J. P. Lippincott Company. 1907.

The Sexual Instinct. Its Dangers as Affecting Heredity and Morals. By James Foster Scott, M. D. Second edition. New York: E. B. Treat & Co. 1908. Price, $2.00.

Hospital Training School Methods and the Head Nurse. By Charlotte A. Aikens. Philadelphia and London: W. B. Saunders Company, 1907. Cloth, $1.50, net.

Mortmain. By Arthur Train. Fiction. D. Appleton & Company, New York, 1907. Illustrated, cloth, $1.50.

A Very Young Ovum in Situ. By Prof. G. Leopold, Dresden. Authorized English Translation by W. H. Vogt, M.D., St. Louis, Mo. C. V. Mosby Company, St. Louis, 1907. Price $3.50.

A Text-Book of Minor Surgery. By Edward Milton Foote, A.M., M.D. D. Appleton & Company, New York and London, 1908.

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SURGICAL PHASES OF ENTEROPTOSIS

BY JOHN G. CLARK, M. D., PHILADELPHIA

IT is with some hesitation that I present this paper upon "The Surgical Phases of Enteroptosis," for the present status of this question does not warrant the establishment of dogmatic lines for the operative treatment of general ptosis of the abdominal organs; and were we, with our limited knowledge, to assume that this condition belongs largely to the surgical domain, even a greater number of unjustifiable operations would be performed than has been noted in the treatment of nephroptosis. It would be better, therefore, to consider these cases under the caption: "The Surgical Treatment of Cases of Enteroptosis in Which Medical and Mechanical Means of Relief Have Failed."

Since Glénard first wrote his classic article upon the disabilities produced by descensus of the abdominal viscera, comparatively little progress has been made in the diagnosis and treatment of enteroptosis until within the last few years.

The Roentgen Ray in Diagnosis. While with certainty dilatation and descensus of the stomach have been diagnosticated, before the application of the X-ray for this purpose, the determination of the exact extent of ptosis of the large intestine and of the mechanical disabilities produced by it was, at best, more or less hypothetical. For several years I have systematically employed atmospheric distention of the colon for the purpose of defining its position, but this has always been an uncertain method. The use of the sigmoidoscope is also unproductive of results. The recent employment of the X-ray, for the purpose of determining the extent of ptosis of the colon and of the stomach, is one of the most valuable additions to our clinical methods of examination, and has largely made up the deficiencies which have been noted in our previous diagnostic procedures. Having studied a large number of cases, with and without the aid of the X-ray, I now feel that it is an absolutely essential factor in formulating any plan of treatment in these cases, except when the ptosis is encountered in the course of an operation for some other more important indication. Then the history of the case, so far as it relates to the symptoms of indigestion, intestinal pain, tympanites, etc., must be the surgical guide.

Enteroptosis Primarily a Medical Condition. At the University of Pennsylvania there is a group of young men in the Medical and Roetgen Ray Departments, who have been systematically studying the question of enteroptosis, from the diagnostic and therapeutic standpoints, for the last six or eight years; and some of the best literature upon this subject has emanated from this source. The surgical consideration of this subject, therefore, has been of great interest, for I have felt that with this group of enthusiastic colleagues, who have investigated the question so thoroughly from the medical aspect, it is possible for these patients to have the best treatment before resorting to any surgical means of relief.

From the experience of these investigators, it is very evident that a majority of patients

Fig. 1. Normal situation of stomach in a [illegible] hardened subject. (By courtesy of Dr. Piersol. Human Anatomy, 1907.)

suffering from various ptosis of the abdominal viscera may be so much relieved, or cured, that surgical intervention is unnecessary. One is safe, therefore, in making the statement that thus far we may look upon these various conditions as belonging to the province of a skilled physician, and only when he fails and largely by his advice should operative intervention be considered.

In the gynecological department of the University of Pennsylvania Hospital, it is a rule, after arriving at a determination that enteroptosis is the sole or chief factor in a patient's major symptoms, at once to transfer the case to the medical wards for treatment. It is not a matter of regret to say that only a few of these cases are referred back to us for surgical treatment, for the patient, if not actually cured, is usually sufficiently improved in her general condition to be satisfied with the result, and prefers even moderate relief to a questionable cure by operation. We employ the expression "questionable cure" after the study of our cases, for while we have had a number of brilliant results we have also had several failures. Consequently it may be said, that up to the present time there is no plan of surgical treatment which offers a maximum certainty of cure, even when the physician fails to relieve the patient by medical and mechanical means.

Therefore, as a preliminary statement, one may say that the surgical treatment is still under consideration; but it is our hope, based upon the study of a considerable number of patients, that further principles may be elaborated for guidance in cases of exaggerated ptosis, incurable by other than surgical means, that may prove reasonably efficacious.

Reflex Symptoms. These cases are usually grouped under the ill-defined terms, neurasthenia, dyspepsia, indigestion, and reflex neuroses, all of which names are employed as mere subterfuges, for they do not define any given disease and simply beg the question.

With increasing experience I have come to look upon the so-called "reflex pains," refer-

Fig. 2. Stomach removed, showing normal situation of transverse colon. The splenic flexure is situated much higher than the hepatic. In exaggerated ptosis of this part of the colon the two flexures may be kinked acutely. (By courtesy of Dr. Piersol. Human Anatomy, 1907.)

Fig. 3. Exaggerated ptosis of the stomach without serious symptoms; the notch in the smaller curvature is comparatively shallow and there is no obstruction at the pylorus. In such a case operation is not indicated because the gastric symptoms are not exaggerated. Such a condition is likely to be encountered in a case of congenital habitus. (Skiagraph by Dr. Pancoast.)

able to the abdominal viscera as of minor significance. Until Glénard's disease was more generally recognized and understood, the pelvic organs were looked upon as the source of a multitude of these symptoms, in fact they were considered veritable plague-spots for reflex emanations.

A dangerous "pelvic myopia" was engendered in the past by this reflex theory: for under its guidance many a minor pelvic lesion has been corrected, while the symptoms of a major abdominal lesion may have been cloaked under the hazy cloud of reflex symptoms. This has especially been true in cases of chronic gastric ulcer, cholelithiasis, and notably of enteroptosis. That the teaching along this line is becoming broader is quite evident: for in any modern medical school where cases are systematically studied in ward-classes, it is seldom indeed that even the poorer students will fail to recognize a well-defined group of symptoms pointing to ptosis of the abdominal viscera. In gynecological cases these ptoses are especially likely to occur, for the descent of the viscera may be a sequel to rapid child-bearing or difficult labors, which leave in their train a diastasis of the recti muscles and relaxation of the pelvic floor, with a retroflexion or a prolapsus of the uterus. Time and again, I have seen the pelvic symptoms incident to the pelvic disability entirely relieved by operative intervention; but the patient continued to suffer with all of her gastrointestinal symptoms, not because they were reflex, but from

Fig. 4. Exaggerated ptosis and dilatation of stomach. Deep notch in smaller curvature. Acute kinking at the pylorus which is situated relatively high. Fig. 5 represents the same case after omento-ventral suspension. (Coffey hammock operation.) This patient was completely relieved by this operation. (Skiagraph by Dr. Pancoast.)

the fact that the ptosis, which was coincident with the pelvic disability, was quite as bad after the operation as before. It has been this class of cases which has drawn my attention to the various means which may be adopted for their cure.

Variation in Symptoms. There is no set of cases which shows such a wide variation in symptoms in proportion to the lesion as this. In one case the stomach, colon, and kidneys may all be in an exaggerated degree of descensus, and yet very few symptoms are evident. In another case of less ptosis, the functional disturbances are very decided. The use of the X-ray gives us much information in differentiating cases: for, in one set in which there are decided symptoms, a deep notch may be found in the smaller curvature of the stomach: in another, a marked prolapsus of the transverse colon is noted; while in a third the bismuth injection reveals a redundant sigmoid. In another class of cases, even a greater degree of ptosis is noted, and yet there are no abnormal detention points, hence peristalsis carries the food onward without serious impediment. (Figs. 3 and 4).

If, therefore, an operation were to be instituted in every case of ptosis, simply because the X-ray demonstrated even a marked splanchnoptosis, I am sure we would pass through as irrational a period of surgery as has been exhibited in the treatment of movable kidneys, and as I fear, is being shown at present by the seeker after surgical novelties in the employ-

Fig. 5. Below the dark circle the transverse colon, after showing a kink from the hepatic flexture to this point, drops almost to McBurney's point, where it is held by old adhesions. This patient suffered severe colicky pains, and was only relieved by release of adhesions.

ment of gastrointestinal anastomisis for all sorts of stomach lesions. The very fact that thousands of physiologically movable kidneys have been anchored most unjustifiably should be a warning against the inauguration of a similar policy with reference to ptosis of the intestinal tract.

In the neurasthenic individual who complains of indigestion, nervousness, etc., etc., who has as an incident a movable kidney, there is no procedure less likely to bring salutary results than the anchoring of the kidney. Nephrorrhaphy in such cases, is an opprobrium to surgical art, for these patients are not relieved, but on the contrary are made worse, as is every neurasthenic who is not relieved by an operation; for their morbid intraspective ideas of disease become all the more fixed by this failure.

From our experience with the use of the X-ray as a diagnostic means, we find we are more nearly able to select those cases in which mchanical defects are noted, which may possibly be corrected by operations so that the gastrointestinal functions may be carried on without painful or disabling symptoms.

SURGICAL GROUPING OF CASES

As we have encountered these cases they may be grouped for consideration under the following headings:

1. *The Cases of Congenital Habitus.* As Smith has pointed out in his excellent article on this subject (Transactions of the Am. Gynec. Society, 1906), these cases are characterized: 1. By a flabbiness or hypotonus of the body tissues. 2. By a lack of vital energy. 3. By a more or less pronounced backwardness in development. Symptomatically, the patient complains of "inability to carry on her work without exhaustion, nervousness, often times melancholy, constipation, and disturbances of digestion and other functions, such as those of menstruation and urination. Patients commonly have pain in the back, in one or both sides, and in the lower abdomen, bearing-down pain, and leucorrhœa." In other words, a type of neurasthenia in which the body may be

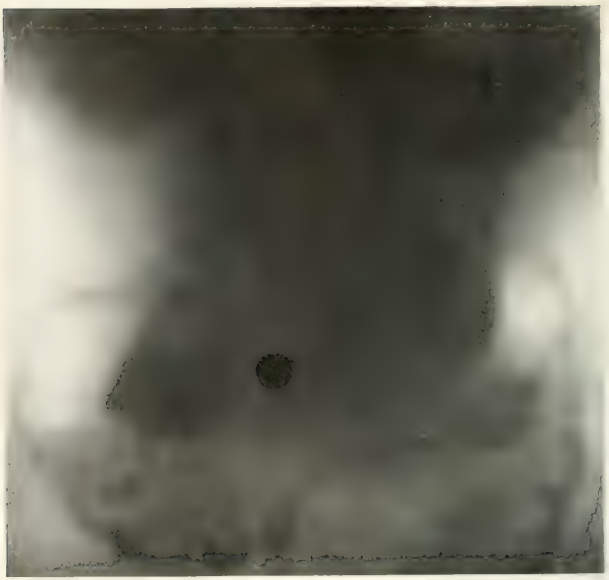


Fig. 6. The sharply marked black border located just below the round dot, which indicates the site of the umbilicus, represents the lower curvature of the stomach, which rests in the hammock produced by pulling the transverse colon up by the omentum which is fixed to the anterior abdominal wall. (Coffey operation.) (Skiagraph by Dr. Pancoast.)

aptly likened to a fully equipped electric plant with a dynamo too small to run it.

A surgeon who believes that he can make good this dynamic defect by any operation upon the ptosed organs, will find that his energies are badly directed, for little can be done for these patients by the physician, and only harm can follow surgical intervention, except in the rarest exceptions. Therefore, it is most unwise to attempt surgical treatment for a bodily habitus which does not involve one organ, but usually all in the abdominal cavity. To tack up one or both kidneys, to suspend any of the hollow viscera, or to shorten the ligaments of the uterus, corrects only one small part of the general trouble, and as a result of the operation, a pathologic condition may be left behind which imposes a still greater burden upon the defective dynamo and makes a more hopeless neurasthenic of the patient than ever.

2. *The Cases Acquired from Natural Causes.* This class is especially noted in women who have rapidly borne children, without proper obstetrical care and puerperal supervision. The pelvic viscera drop into vicious ptosis, due to the failure to repair the pelvic diaphragm and the inefficient return of the abdominal wall to its normal tonicity. Under these conditions the abdominal viscera lose their ventral support and tend to sag; and sooner or later the train of symptoms, so characteristic of this condition, appears. These cases, if treated at a reasonably early period, respond splendidly and give most satisfactory results. In many instances Webster's operation, in addition to the surgery necessary to restore the pelvic floor and the uterus to normal, effects a perfect cure.

Another group of cases, which I am convinced comprises a large number, includes women of very constipated habit. When one realizes that

Fig. 7. Exaggerated descensus and redundancy of the transverse colon, attended with recurring symptoms of obstruction. The loop could easily be twisted upon itself, and there were acute kinks formed at the hepatic and splenic flexures when the transverse colon was overloaded. Resection of fourteen inches of the transverse colon was followed by complete cure. The patient has gained 30 pounds since the operation. (Skiagraph by Dr. Pancoast.)

the colon is merely a reservoir for inspissated particles of feces, and that two of its sections, the transverse colon and the sigmoid, are very movable and may be greatly dragged upon by overloading, it does not seem possible to escape the conclusion that when the constipation extends, as it frequently does, over days and has been a habit for years, ill results from this undue traction upon the mesenteric attachments and the stomach, which is linked with the transverse colon, must inevitably take place. (Fig. 7.) Especially if, in addition to this bad habit, the patient subjects herself to excessive pressure and constriction of the abdominal wall, incident to a tight corset and clothing suspended from close-fitting waist bands. In this class of cases ptosis of the sigmoid, transverse colon, and stomach are likely to be noted in the order named. In some of our cases the sigmoid flexure has apparently been the chief trouble, for when its position was changed by operation so that it could not fall into a loop lying cramped up in Douglass' cul-de-sac, the symptoms were relieved. In such a sigmoid the constipation may increase to a type of fecal obstruction, for the greater its impaction the more acute becomes the kink at the brim of the pelvis and the greater the lateral pressure on the rectum. Such cases are likely to alternate between periods of obstinate constipation and

Fig. 8. Excessively redundant sigmoid flexure which could easily be pulled up as high as the diaphragm. A case like this may produce such exaggerated symptoms as to require resection. Two such cases have been encountered in our series, and both were relieved by excision of 14 and 16 inches respectively, of the sigmoid flexure with end to end anastomosis.

free diarrhœa, and may be characterized by more or less mucus in the stools. (Fig. 8.)

Also I am convinced that many of our women patients, who have pains ascribed to the left ovary, are really suffering from either a sigmoid ptosis or actual tension pain from the pulling of the sigmoidal mesentery over the brim of the pelvis. In the most exaggerated forms of this dislocation, actual obstruction or gangrene of the sigmoid may occur. Such a sequel as gangrene is extremely rare, for after heroic dosing with purgatives and injections of drastic enemeta, an evacuation is effected. In this class of cases I have resorted to three measures:

Festooning the redundant sigmoid back into the loin by means of its own mesentery; actual suture of the sigmoid to the ventral wall; and resection of the sigmoid. In cases of extensive ptosis of the transverse colon, with kinking either at the hepatic or splenic flexure, omento-ventral suture (Coffey operation) has been employed; and in one case in which there was a recurrence with a return of obstructive symptoms, 14 inches of the transverse colon was exsected and an end-to-end anastomosis done, with perfect relief of the patient.

3. *Acquired Cases from Post-operative Adhesions, Hernia, or Following the Removal of Large Tumors.* Every surgeon realizes that post-operative adhesions, when general, produce an infinite variety of intestinal symptoms from tympanites, constipation, regurgitation of food to actual obstruction and gangrene. It is with the chronic cases, affecting the colon and stomach, that this paper particularly deals.

No operation is more unsatisfactory than the breaking up of universal adhesions among small intestines, for a recurrence of symptoms is usually noted from reproduction of adhesions. Such an operation is truly a hit-and-miss procedure. On the other hand, in many cases the omentum gravitates to an inflamed area, or into an hernial sac, and becomes fixed by adhesions. Such fixations rarely give rise to exaggerated symptoms, as every surgeon knows; on the other hand, occasionally the transverse colon may be dragged into such an unnatural position that its well-known physiological ability to functionate, even under the most adverse conditions, is circumvented and aptosis and partial obstruction of the organ not only occurs, but the stomach is likewise drawn out of place and the pylorus may be kinked sufficiently to give rise to gastric symptoms. (Figs. 9 and 10; Fig. *d*.)

In both Class 2 and Class 3, the stomach is usually drawn downward by the gastro-colonic omentum, and the gastric symptoms may be the chief ones.

Post-Operative Care of These Cases. Many surgical results are vitiated by a too early release from the surgeon's supervision, and of all cases there are none to which this mistake worse applies than to the class under consideration. To perform any one of these operations without the most careful supervision of the patients subsequently, will lead more often to failure than to success. Therefore, the bowels should be carefully regulated to prevent a recurrence of constipation, and a carefully fitted abdominal binder, or corset, should be worn for months.

Review of Results. From a review of our case-histories certain very suggestive factors are bought out: In the first place, all of these suspension operations which are done with a view to lifting the viscera from a distorted position into a normal one, so that they may functionate properly without pathologic symptoms, fly in the face of anatomic laws and are always attended with a considerable risk of recurrence. This comes from the fact that, at best, the points of suspension are frail, and unless firm adhesions take place between the points of peritoneal contact, there will inevitably be a recurrence.

Notwithstanding all of these objections, our cases, which now number 35, show about 50 per cent of symptomatic cures, and the remainder give the usual story of patients not completely relieved by operation: some being slightly improved, some no better, while one or two claim to be worse than before the operation, and one died subsequent to operation.

Types of Operation. Among the operations which have been performed is Webster's, which consists in taking up a relaxed abdominal wall by bringing into apposition the recti muscles, and thus overcoming any further tendency to a diastasis which, in a sense, permits a variety of large ventral hernia. In these acquired cases some of the best results are noted, in that a return of the abdominal muscles to their normal restores the intra-abdominal force and visceral equilibrium, so that after a short time the patient's symptoms disappear.

Fig. 10. Exaggerated distortion and dislocation of the transverse colon, easily correctable by releasing the incarcerated omentum from an inguinal hernia. In such a case serious or even fatal obstructive symptoms, may be produced.

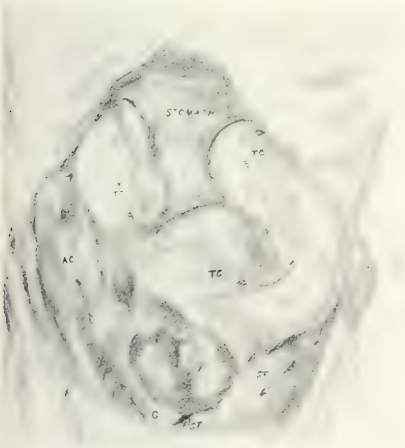


Fig. 9. Exaggerated ptosis and distortion of the colon, from adhesions following peritonitis. Discovered in an anatomical subject.

As observed in our cases, child-birth after any of these operations for ptosis may be followed by a recurrence. This is probably due to the fact that the uterus in its upward growth pushes the intestines out of the way, and temporarily relieves the suspension points of weight, but as soon as the child is born there is again dragging upon the points of fixation, with the probability of their breaking away, especially if the anterior abdominal wall is very flabby.

The operations which we have largely employed, in addition to the Webster operation,

are: Suspension of the sigmoid in cases of great redundancy and the suspension of the transverse colon by omentoventral suture (Coffey method). (Fig. 11.) In no case has gastroenterostomy been performed; and only twice have we performed the operation suggested by my colleague, Dr. Beyea, for the shortening of the gastric ligaments. In pronounced cases of ptosis of the stomach Beyea's operation, however, holds out a very satisfactory prognosis for relief, for in a considerable series of cases in his own hands the results have been most gratifying.

The operative conditions to be met in ptosis of the stomach are: kinking of the pylorus and marked dilatation. In these cases the value of the X-ray, in determining the difficulties in the case, is very great, for by this means one can usually estimate the amount of kinking at the pylorus. If the pylorus is situated low and the stomach assumes a perpendicular position, symptoms of ptosis are usually absent because evacuation of the stomach is very satisfactory. In such a case it would be most unwise to interfere in any way with the position of the stomach, for to lift it would most likely produce the very distortion which up to that time has not occurred, viz., kinking at the pylorus. If, on the other hand, the cardiac end of the stomach has become greatly dilated and pouch-like, necessitating the injection of food through a kinked pylorus, some mechanical restoration may be necessary. This is very well demonstrated by the deep notch shown in an X-ray negative, and is quite significant in the exaggerated cases with symptoms. (Fig. 4.) In some of these cases, the Beyea operation is of value, especially if there is no associated ptosis of the transverse colon. If this is present, it may be necessary after shortening the supports of the stomach, to relieve the stomach of the extra weight of the transverse colon by suspending it by means of the omentum. When the stomach is greatly prolapsed, so that it occupies almost or quite a pelvic position, it might be advisable to close the pylorus and perform a no-loop gastroenterostomy. Upon this point I have had little experience, for I have seen but one case in which the procedure seemed to be advisable. In another case, which I have recently observed,

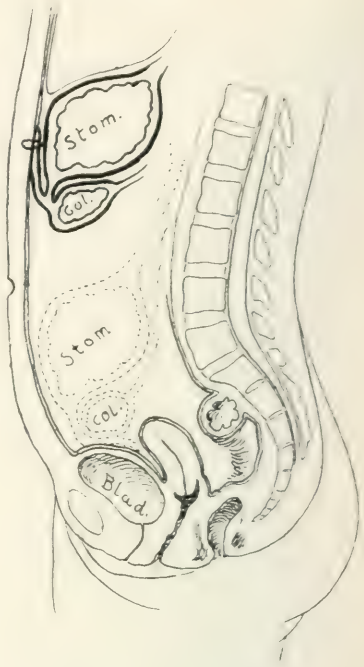


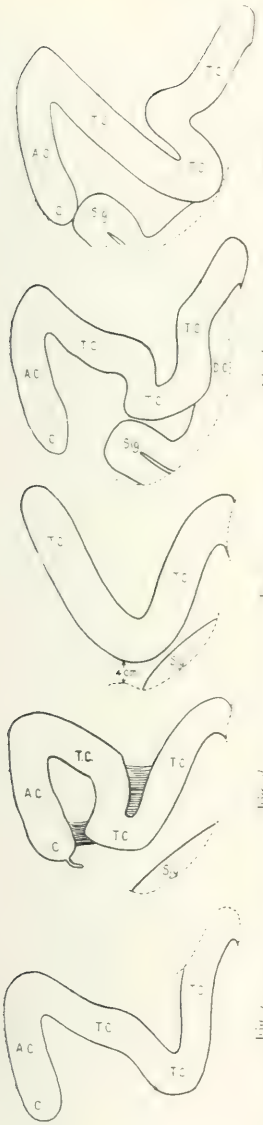
Fig. 11. Schematic depiction of the ventral attachment of the omentum for the support of the stomach and the suspension of the transverse colon. (Coffey operation.) The transverse colon and stomach may be elevated from the dotted outlined position to the nearly normal heavy lines.

where a simple gastroenterostomy was performed by another surgeon, there was a type of vicious circle established through failure to close the pylorus. In this case the X-ray showed the bismuth passing out of the pylorus as well as the artificial opening — both, however, meeting below the site of anastomosis in the form of a whirlpool.

CONCLUSIONS

From a review of our experience, we may draw the following tentative conclusions:

1. No case of enteroptosis should be operated upon until medical and mechanical means have been exhausted without relief.



Figs. *a*, *b*, *c*, *d* and *e*. Various abnormalities in position of the transverse colon encountered in a case of ptosis (after Dr. Lathe). Only in exaggerated cases as in Figs. *a*, *b*, *c*, and *d* are symptoms likely to be noted. Even in cases of the latter type the colonic impediment may be corrected without entero-fixation.

Fig. *f*. Unusual relationship of cæcum to transverse colon, not necessarily productive of pathological symptoms.

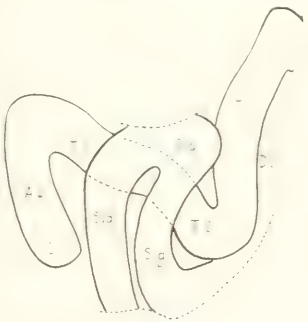


Fig. *g*. Exaggerated redundancy of sigmoid of patho-[illegible] type

2. Cases of ptosis due to a congenital habitus will not be relieved by operation, except in the rarest instances; they should not be considered, therefore, as amenable to surgical treatment.

3. In order to arrive at an accurate estimate of the degree of ptosis, the X-ray should be employed.

4. In cases following child-birth, where the abdominal wall is very lax, thus destroying the equilibrium between the extra- and intra-abdominal force, resection of the relaxed ventral tissue through the method suggested by Webster, may give perfect relief, provided the diastasis has not been of such long standing that the abdominal organs are far below their normal levels.

5. In the latter case, in addition to the Webster operation, it may be necessary to suspend the colon by means of the omentum, thus relieving the stomach of the weight of this organ, and at least temporarily supporting the stomach until there may be a natural shortening of its ligaments.

6. In a simple gastroptosis without marked participation of the colon, the Beyea operation may be the one of preference.)

7. If the cardiac end of the stomach has been greatly dilated, forming a kink at the pylorus and a decided notch in the lesser curvature, a no-loop gastroenterostomy may be necessary, with closure of the pylorus. (This is merely a suggestion, for the writer has had experience in only one case with this operation.

8. In exaggerated cases of ptosis of the transverse colon, where a pendulous loop is formed which produces stasis of the fecal current, as well as tending to twist upon itself, with symptoms of partial obstruction, nothing less than excision of the redundant loop with end-to-end anastomosis will cure the case.

9. In cases of redundant sigmoid, with more or less constant pain in the left side, associated with obstinate constipation, a suspension of the sigmoid so as to pull it up out of this bad position in the pelvis, may give entire relief. On account of the constant mobility of the sigmoid a recurrence may be noted.

10. In exaggerated cases of redundant sigmoid attended with symptoms of extreme constipation, verging on to obstruction, a resection of the sigmoid may be advisable.

11. In all cases a carefully fitted abdominal support, or carefully adjusted straight front corset, should be worn after operation in order to give as much artificial support as possible.

In the study of these cases I have had the expert services of Dr. Pancoast, chief of the Roentgen Ray Laboratory of the University Hospital, and the assistance of Dr. Luther in the anatomical investigations, carried out in the anatomical and pathological laboratories.

DERMOIDS OF THE INGUINAL CANAL

With Report of a Case

By GEORGE C. WAISS, M. D., Chicago, Illinois

Dermoids in the region of the inguinal canal are of such rare occurrence as to make them of pathological interest, rather than of surgical importance. After a fairly careful search in the literature of dermoid cysts, I have been able to find a description of but one case at all resembling my own. So eminent an authority as Kaufman, in his special pathological anatomy, does not even mention dermoids in this region. Bland Sutton remarks that cysts, in relation to the inguinal canal, have been described as dermoids, but the records are not to be relied upon. Cysts have been assumed to be dermoids on no other evidence than that they contain pultaceous material. The only case in which the wall of the sac was examined microscopically is that of H. J. Patterson, and reported by him in the transactions of the London Path. Society in 1903.

He removed a cyst from the inguinal canal of a man, 35 years of age. The cyst measured 2¾ inch by 1 inch. A single hair was found on the interior of the anterior wall. This is the only case I can find which at all resembles my own, given below.

History of the patient, description of the operation, and of the cyst — Name, Henry Semler, male, aged 37 years. Nationality, German, a rather poorly nourished individual of anæmic appearance. Family history of no special interest.

Personal history: Has had the usual diseases of childhood, whooping cough, measles, diphtheria, and, at the age of fifteen, typhoid fever. Since that time, has been in the best of health. No history of specific infection at any time.

Fourteen years ago, while at work, he noticed a slight pain in the right inguinal region. Upon examination he found a swelling present, the size of a hickory nut. The pain left him the next day and he paid no more attention to it at the time. The swelling increased very slowly up to about January, 1906. From that time on, the patient thought, it increased in size rapidly.

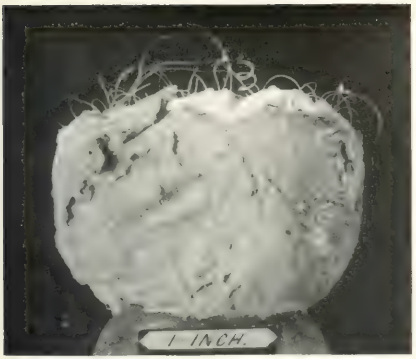


Fig. 1. Photograph of the specimen after removal.

The patient entered St. Anthony's Hospital May 18, 1907. On examination, a swelling was found occupying the right inguinal region. The swelling was oval in shape, with the long axis in the line of the inguinal canal. Palpation gave a peculiar sensation to the examining fingers; it felt as though fluid would rush from one cavity into another, accompanied by a slight grating. The spermatic cord could be traced through the external abdominal ring, where it seemed to spread out over the swelling. Slight traction on the cord would move the swelling very slightly. A probable diagnosis of cyst, in relation to the spermatic cord, was made.

Operation: An incision was made directly over the swelling, and on cutting through the external oblique, the swelling, which was exposed, proved to be a cyst, and it was found that the spermatic cord was not included in the cyst, but was adherent to the external lateral side. The cord was carefully dissected free. After this it was found that the cyst was firmly adherent with the anterior surface of the pubic bone, to which it was attached by fibrous union. Although no hernia was present, there presented a large gap formerly occupied by the cyst. This gap was closed by interrupted catgut sutures.

Macroscopical appearance of the cyst. The cyst, upon removal, presented the following peculiarities: of oval outline, cystic consistency, length 7 cm., width 5 cm. The external covering, consisting of fibrous tissue, had a ragged appearance due to the numerous adhesions which had surrounded the cyst.

On incising the cyst, some fluid escaped, but the greater part of the interior was occupied by a pultaceous mass, mixed with a large amount of hair. The color of this hair was mostly blond, almost white. In length, the longest hair measured 6 cm.

The interior of the cyst wall presented an almost smooth surface, with a slight roughness here and there. At these spots hair was found attached to the wall, but the most hair was mixed with the pultaceous mass which filled the cyst.

Microscopical examination. A number of small pieces were taken from different parts of the cyst wall, and fixed in alcohol, formalin, and Zenker's fluid.

Sections stained by the usual method showed a well marked epidermis present. This epidermis is very uneven in its outline, as well as in its thickness. At some parts it measured but $\frac{1}{160}$ mm. increasing in thickness in parts up to $\frac{1}{5}$ mm.

The deepest cells of the epidermis are cylindrical in shape, and are perpendicular to the basement membrane. Their nuclei stain very deep with hemotoxlin. The layer above this cylindrical layer is composed of polyhedral cells, with a vesicular nuclei. These cells do not stain well, and I could not demonstrate any intercellular bridges.

The granular layer, although present, is not well marked. At times, there appears to be but one faintly staining cell lying between the layer below and the horny layer above. No stratum lucidum could be demonstrated in the section which I examined. The stratum cornium, which lay in close connection with the stratum granulosum, was demonstrated with Mallory's connective tissue stain, which colored the connective tissue blue, and the horny tissue a brilliant red.

The derma. No well-defined papillary layer is

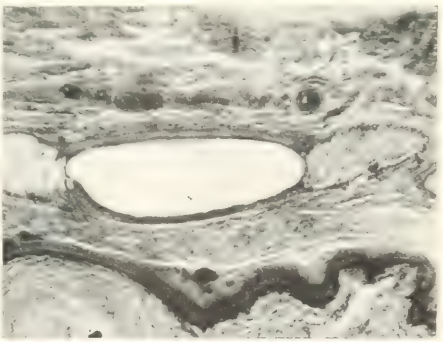


Fig. 2. Photomicrograph of cyst wall. 74

present, neither is the outline straight, but here and there are irregular connective tissue elevations. The reticular layer of the cornium consists of interlacing connective tissue fibers, which stain a dense blue with Mallory's connective tissue stain. This layer contains a large number of sebaceous glands. These glands are very large in size, and in some instances, cystic spaces are found in the center of them. Again, a number of cyst spaces are found with a sebaceous gland at either end of the same. The spaces are lined with the same epithelium as the sebaceous gland. A number of glandular structures are present. These gland-like structures are of different sizes and shapes. The most of them are composed of cubical epithelium. Some of them appear to be dilated sweat glands.

Hair follicles are found in small numbers, only.

Sweat glands, although present, were found in but few of the sections examined.

Blood-vessels were mostly found in the upper part of the reticular layer.

A very delicate layer of elastic tissue was demonstrated with Weigert's elastic tissue stain. No muscle tissue was found in the sections examined.

ARTERIO-SCLEROSIS OF THE UTERUS

With Report of a Case

By ROBERT B. SLOCUM, M.D., Wilmington, N. C.

THE case is one of severe uterine hemorrhage and "apoplexy" of an ovary in a woman twelve years past the menopause. The patient, a white woman 57 years old, was sent to me by Doctor George F. Lucas of Currie, N. C.

Complaint: Bleeding from the womb and pain in the right side.

Family History: Unimportant.

Past History: Generally negative. Menstruation began at fourteen; married at eighteen; during first pregnancy (19 years) patient had typhoid fever and aborted twins at about the third month. Since then she has borne eight living children and aborted twice. Menstruation ceased at 45 years. One year later bleeding recurred at irregular intervals: this grew to be very serious and patient was in a hospital eight months for treatment. After three years the bleeding stopped entirely and she enjoyed good health for eight years. During this time there was no bleeding at all.

Present Illness: One year ago, while lifting a rather heavy load, patient was seized with a severe pain in the right side. She was put to bed and a physician, who saw her at the time, called the attack acute appendicitis. The acute pain gradually subsided but has never left entirely. Shortly after this acute attack, while still in bed, uterine hemorrhages began, small amounts at first at irregular intervals, but increasing in spite of the treatment. She was kept in bed and given ergot freely for a month but with no improvement. The uterus was then curetted and packed but the bleeding recurred at once even more profusely than before. From this time until admission to the hospital (Aug. 27th) the bleeding was very profuse and patient grew weak and anæmic: in fact, she has never been out of bed a whole day since the acute attack a year ago. Curettage and packing (with various local applications) was repeated twice more without avail. It is noteworthy that there has never been any foul odor to the discharge.

Physical Examination: I saw the patient for the first time on August 27th. She was anæmic (hæmoglobin 35 per cent) but well nourished. The general examination was negative except for a systolic heart murmur which I thought to be hæmic in origin. There was no cardiac enlargement and the murmur was not transmitted to the axilla. No general arterio-sclerosis beyond what would be expected in a woman 57 years old. The urine showed a trace of albumin but no casts. Pelvic examination revealed a profuse, bloody discharge from the uterus, the blood being clear and having none of the foul odor characteristic of cancer. The crevix was hard, smooth, and pale. The uterus was rather large but otherwise seemed normal. A definite mass was felt in the region of the right ovary.

In view of the fact that the uterus had been curetted so much and the patient was in such bad condition an immediate hysterectomy was advised.

Operation: Aug. 29, 1907. Upon opening the abdomen the omentum was found to be adherent to the right ovary. This was easily separated and the ovary was found to contain a blood clot which had broken through the capsule and was adherent to the omentum. The ovarian arteries were hard, in fact, the left one continued to spurt after being tied reasonably tight. The uterine arteries also were hard and brittle so that they could be easily felt throughout their course. A pan-hysterectomy was done and the patient made a good recovery, leaving the hospital Sept. 23d, in excellent condition.

Pathological Examination: The uterus measures about 12 cm. in length, is hard and smooth. No infarct is found anywhere in it. Upon splitting it lengthwise the arteries stand out prominently in the muscu-

lature as hard, non-collapsible tubes. The right ovary contains an old clot of blood as large as a hen's egg. This clot seems to be simply an extravasation into the substance of the ovary. At one point the capsule is ruptured and some of the clot has escaped.

Microscopic Examination: The uterine mucosa shows nothing to suggest cancer. The uterine musculature is largely replaced by connective tissue and the arteries are much thickened, especially in the media (cf. section No. 2). The arteries are not occluded but thick and patent.

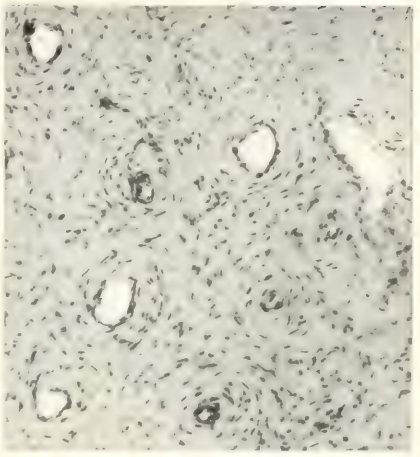
As very little was to be found in the textbooks, I was interested in looking up the literature. Kelly (0) mentions arterio-sclerosis as a cause of uterine hemorrhage and gives a few references. Gebhard (1) and Orth (2) both mention it, the former stating that hyaline changes and calcification of uterine arteries are not rare.

Cruveilhier (3) first described a condition which he named "apoplexia uteri." He calls attention to the frequency with which hemorrhages into the body of the uterus are found at autopsy in cases of elderly women: the hemorrhages being limited to the body of the uterus, either into the mucosa or into the musculature. The condition he considers of no especial clinical interest as there is rarely any external bleeding and then only just before death and never in serious amounts.

Rokitanski (4) likewise speaks of "apoplexia uteri" in women of advanced age, the hemorrhages usually being into the fundus and posterior wall of the uterus, never into the cervix. At section the cavity of the uterus is often found filled with blood clots. Klob (5) describes the same condition in which the uterine substance is hard, and on section "the rigid arteries stand out as whitish, non-retracting stumps."

Herxheimer (6) is the first to report a case in detail — a woman 52 years old who, at autopsy, showed chronic nephritis, cardiac hypertrophy, and thrombosis, pulmonary infarcts and pneumonia, embolism of the right hypogastric artery, etc.

C. v. Kahlden (7) gives careful accounts of post-mortem findings in eight cases but no clinical histories. The eight cases are all in women of advanced age (from 52 to 87 years). The uterus may be large, small, or normal in size; blood clots are sometimes found in the uterine cavity; the hemorrhages are always



Photomicrograph of section of uterine wall.

into the body of the uterus and never into the cervix. On section of the uterus groups of arteries are found to have narrow lumens with thick, calcified walls. Microscopic examination shows the intima to be the coat chiefly thickened often obliterating the lumen entirely. The uterine muscle is largely replaced by connective tissue. All of his cases died of cardiac or pulmonary disease.

Dittrich (8) reports two cases of a similar character, 65 and 68 years, both having died of pulmonary disease. Simmonds (9) considers the hemorrhage to be due to weak cardiac action, the "apoplexy" being thus "only an agonal or preagonal phenomenon" which is usually of no clinical significance. So Barbour (10) says that "arterio-sclerosis after the menopause has been frequently described but never as accompanied by serious hemorrhage."

Popoff (11) describes a case of hemiplegia in a woman 40 years old, in whom both uterine arteries were found occluded by thrombi. Kaufmann (12), in speaking of cases of so-called "apoplexy of the uterus," says that they are due to arterio-sclerosis of the uterine arteries and, as a rule, have no clinical significance. Bland Sutton (13) refers to the same condition, calling it fibrosis of the uterus.

Palmer Findley (14) reports the case of a woman of 70 years who, fourteen days before death, complained of pain in the abdomen and chest; at the same time there was a bloody uterine discharge. At post-mortem there was found hemorrhagic infarction of the lungs and of the uterus caused by plugging of the sclerosed arteries with clots from the heart. He makes the point that the arterio-sclerosis, in itself, is not the cause of the uterine bleeding but only in connection with some circulatory obstruction, e. g., cardiac or pulmonary disease. This view is supported by the cases which we have cited: thus Herxheimer's case died with cardiac thrombosis, etc., all of v. Kahlden's cases died of pulmonary or cardiac disease, one of Dittrich's cases died of pneumonia and the other of emphysema.

It will be noticed that all of the cases quoted so far have been in women past the menopause, and have been of pathological more than of clinical interest. Whenever there has been any microscopic report the intima has been the coat chiefly thickened and the vessels are often occluded. This would seem to be the normal course. Westphalen (15) writing in connection with an article by R. Thoma ("Ueber die Abhangigkeit der Bindegewebsneubildung in der Arterien-intima von den mechanischen Bedingungen des Blutlaufes") states that in infants the intima is almost free from connective tissue; in young, menstruating women who have not borne children there is a small amount of connective tissue but in multipara there is a marked increase. He considers this to be due to the periodic changes in circulation. The only other arteries showing a similar condition are the splenic, the periodic circulatory changes in the spleen accounting for the condition. J. Balin (16) speaks of the obliteration of part of the uterine arteries after child-birth by the connective tissue of the intima.

In the following cases the clinical side becomes important on account of the external hemorrhages. If will be noted that the patients are all at, or near, the menopause: that the media is the coat involved most prominently, and that the vessels are not occluded but patent and rigid. (In making this grouping I have followed the suggestion of Solowij. cf. below.)

A. H. F. Barbour (17) reports a case of a woman 46 years old, multipara, upon whom a hysterectomy was done for severe hemorrhage. The vessels of the uterine mucosa and musculature, and also those of the broad ligaments, were thickened chiefly in the media. Kustner (18) mentions the death of a woman 36 years old from uterine hemorrhage due to arterio-sclerosis. So Pozzi and Latteux (19) report two cases of hemorrhage from the same cause in patients 34 and 30 years of age. Marchesi (20) cites a case which is an exception to the rule in that the intima and adventitia were thickened instead of the media, although the patient was 32 years old and had required a hysterectomy to control the bleeding.

Reinecke (21) thinks that the hemorrhage is due to the fact that the sclerosed vessels are filled at the menses and the vaso-motors are unable to contract their stiffened walls. In all of his four cases (ranging from 40 to 45 years), hysterectomies were done for uterine hemorrhage. Chalmogoroff (22) reports three similar cases (29, 31, and 42 years of age) in which the media and adventitia were thickened.

Pechevin and Petit (23) also describe a hysterectomy for menorrhagia in a patient 41 years old. Curettage had been done twice but with no improvement. The uterine vessels were found to be much thickened. Morisani (24) had one case of "angiosclerosis invadens" (possibly syphilitic) upon which a vaginal hysterectomy was done to control the bleeding. Kustner (25) reports a case of a death from post-partum hemorrhage. The patient was a primipara, 36 years old, and examination showed sclerosis of the uterine arteries.

The most recent article is that of A. Solowij (26). His case was 41 years old and had been curetted four times for uterine hemorrhage without avail. Vaginal hysterectomy was finally done. The uterus was 11 cm. long, the muscle largely replaced by connective tissue and the arterial walls thickened, especially in the middle coat. The author then suggests the classification which we have followed, i. e., (a) cases of so-called apoplexy of the uterus and (b) cases of external bleeding: the former occurring in older women and having, he says, no clinical interest, the latter being found in

women near the menopause. In discussing treatment he says that ergot is of no avail.

Our case is thus of special interest in that it belongs to the second class although the patient is twelve years past the menopause. It will be remembered that she did have severe hemorrhages for three years following the menopause and if hysterectomy had been done at that time it would have been of no special interest. While writing the paper I have found a report of a similar case. Hysterectomy was done upon a woman 55 years old for uterine bleeding and the uterus showed simply arterio-sclerosis although cancer was suspected. (Dr. T. J. Watkins, (27.)

The common statement is that arterio-sclerosis of the uterus in women past the menopause is of no clinical interest because it causes infarction or apoplexy and not external bleeding. The case reported by Watkins and my own case both go to disprove this idea. Both of the cases were suspected to be malignant from the age, etc. That reported by Dr. Watkins had had severe hemorrhages for "four or five months," whether there had been any bleeding at the menopause or not is not stated.

In conclusion, arterio-sclerosis of the uterus may cause hemorrhage at the same period of life as cancer would. The diagnosis from very early cancer is difficult. As to treatment, ergot, curettage and packing, local applications are of no avail. In most of the cases reported a complete hysterectomy was done rather than a supravaginal because of the questionable diagnosis.

REFERENCES

0. Kelly. Operative Gynecology, vol. i, p. 171.
1. Gebhard. Path. Anat. der Weiblichen Sexualorgane, Leipsig, 1899.
2. Orth. Lehrbuch der speciellen path., Anat., bd. ii, s. 427.
3. Cruveilhier. Anatomie pathologique du corps humain, tome ii.
4. Rokitanski. Lehrbuch path. Anat., bd. iii, s. 469.
5. Klob. Path. Anat. der Weiblichen Sexualorgane. Wien 1864, s. 203.
6. Herxheimer. Echter häemorrhagischer Infark in Gebiete der weiblichen Beckenorgane, Virch. Arch., bd. civ, s. 21.
7. C. v. Kahlden. Ueber die sogenannte "apoplexia uteri," bd. xxiii, s. 161.
8. Dittrich. Zeitschrift fur Heilkunde, bd. x, s. 92, (1890).
9. Simmonds. Ueber Häemorrhagien des Endometriums bei Sklerose der Uterinearterien, Cent. fur Gyn., 1901, s. 81.
10. A. H. F. Barbour. Scot. Med. & Surg. Jour., June, 1905. vol. i, p. 840.
11. Popoff. Zur Kenntniss des hæmorrhagischen Infarktes des Uterus, Arch. fur Gyn., bd. xlvii.
12. Kaufmann. Lehrbuch der speziellen path. Anat., Berlin 1901.
13. Bland Sutton. Brit. Med. Jour., vol. i, p. 840.
14. Palmer Findley. Am. Jour. Obstet. 1901, p. 30.
15. Westphalen. Ueber die Intima der Arteria uterina. Virch. Arch., bd. civ., s. 420.
16. J. Balin. Ueber des Verhalten der Blutgefässe im Uterus nach stattgehabte Geburt., Arch. fur Gyn., bd. xv, s. 157.
17. Barbour. Cf. (10).
18. Küstner. Die Behandlung der postpartum Blutung, Deut. Med. Woch. 1890–91.
19. Pozzi et Latteux. Sur une forme rare de Métrite hémorrhagique angio-sclerose envahissante, Revue de Gynécologie, 1899, vol. iii, p. 771.
20. Marchesi. Sklerose der Gefässe des Uterus, Arch. di Ost. e Gin., Feb. 1897.
21. Reinecke. Die Sklerosis der Uterinearterien und die Klimacterischen Blutungen, Arch. fur Gyn., bd. liii, heft 2, s. 340, (1897).
22. Chalmogoroff. Sklerose der Uterinarterien, Monats. fur Geb. und Gyn., bd. ii, heft 3, 1900.
23. Pechevin und Petit. Métrorrhagies et lésions vasculaires de l'uterus, Gaz. Med. de Paris, Nov. 1895, p. 553.
24. Morisani. Vaginale Hysterectomie wegen hämorrhagischer Metritis, Monats. fur Geb. und Gyn., bd. xiii, s. 841.
25. Kustner. Die Behandlung der post-partum Blutungen, Deut. Med., Woch., 1890–91.
26. A. Solowij. Die Sklerose der Arterien der Gebärmutter als Ursache von unstillbaren Blutungen. Monats. für Geburtshülfe und Gynäkologie, bd. xxv, heft 3, March, 1907.
27. T J. Watkins. Surg, Gyn., and Obst., Nov., 1907, p. 603. (Transactions of Societies.)

THE DEATH OF THE MATURE FETUS IN LABOR[1]

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[illegible]

THE death of the mature fetus during the active period of labor affords an interesting and important study to the accoucheur, as well as to the general practitioner. To the parturient woman, already burdened with the weight of a nine months' pregnancy, with its countless aches and pains, and the ordeal of a tedious or operative delivery, the loss of her child strikes with telling effect. By a more careful supervision during pregnancy and labor, hundreds and thousands of children could be saved to their families and to the State, and the loss of their services can never be estimated. Only when the pregnant woman is placed under the care of a practitioner who is willing to give her the proper attention, and when the midwife, who delivers many thousands of children in the larger cities, is better trained and placed under competent supervision, will the mortality and morbidity rates be reduced.

It is the object of this study to investigate the death of mature children in labor, or within a few hours after delivery, where the death was traced directly to the birth. All fetuses measuring less than forty-eight centimeters in length and weighing less than five pounds are excluded as premature, and therefore possessing lowered vitality. Monsters of all descriptions, incapable of extra-uterine life, as well as children affected with syphilis and other constitutional diseases, are left out of the tables. In order that the life of the fetus is positively known, only those cases are accepted where the fetal heart was heard at some time during the labor. Many precipitate and other deliveries are recorded without stating that the heart tones were heard during labor, and these cases are also excluded.

The first eighty-five cases reported occurred in the service of the Cook County Hospital. Of these, twenty-eight bodies were posted and the findings are recorded. Eighty-nine cases occurred in The Chicago Lying-in Hospital. On these children no autopsies were allowed. The final sixteen occurred in my own practice, and of these, five autopsies were held. The report, then, is based upon 174 stillbirths and 16 deaths, occurring as an immediate result of labor, and 33 autopsies upon stillborn children.

STILLBIRTHS REPORTED IN CHICAGO FOR SEVEN YEARS

Year	Male	Per cent	Female	Per cent	[illegible]	[illegible]	Population
1903	[illegible]	[illegible]	[illegible]	44	[illegible]	29,568	[illegible]
1904	[illegible]	[illegible]	[illegible]	43.00	[illegible]	20,048	[illegible]
1905	1,242	[illegible]	910	43.00	[illegible]	27,343	[illegible]
1906	[illegible]	[illegible]	1,031	42.75	2,356	[illegible]	[illegible]
1907	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27,803	[illegible]
1908	[illegible]	57.35	[illegible]	42.65	[illegible]	20,092	1,909,760
1909	1,341	[illegible]	924	[illegible]	2,265	[illegible]	[illegible]
Total	934	[illegible]	[illegible]	42.50	15,542	[illegible]	[illegible]

These 15,542 stillbirths include both macerated and "fresh" births at full term, and to this number are to be added those whose bodies are disposed of in various ways. It is estimated that but 30 per cent of the living births are reported to the Department. At this ratio, the estimated number of births for the seven years would approximate 575,000, and the percentage of stillbirths would be about 2.7. This agrees very well with the report of Schultze, who found the percentage among 3,843,018 births in Germany to be 2.61. Of 100,381 stillbirths, 20,804 were macerated, or .54 per cent of the whole number. Applying this same percentage to Chicago, it would appear that approximately 3,100 macerated full term children were born during the seven years, leaving 12,437 stillborns who have died during labor. This gives a percentage of 2.16, or one death in every 46 labors. While it is impossible to give any estimate of the number of stillborn children whose deaths are not recorded, it is probably a conservative statement to say that one child dies during labor in every 25 deliveries.

Following is a brief report of the cases:

[1] Read before the Chicago Gyne[illegible] Society, January 18, 1909.

[illegible]

No. of Case	Age	Para.	Pelvis	Diagnosis	Length of First Stage	Length of Second Stage	Heart Tones First Stage	Heart Tones Second Stage	Sex	Weight of Child	Length of Child	Method of Delivery	[illegible]
1	32	1	Justo Minor	OLA	17	3 5	....	140	M	[illegible]	[illegible]	Spontaneous	Fetal heart inaudible one half hour before delivery. [illegible] Autopsy.
2	20	1	Normal	ODA	14	1.75	140	120	M	7	48	Spontaneous	Dry labor. Premature rupture of membranes. Large caput. Child gasped a few times and died.
3	21	1	Normal	OLA	72	7	140	160	M	7	49	Forceps	Long first stage. Uterine inertia. Mother's pulse 130 a minute.
4	42	4	Normal	OLA	13	[illegible]	130	....	F	8.4	[illegible]	Spontaneous	Pains continuous and severe for two hours preceding the delivery. Child died in the second stage.
5	37	1	Justo Minor	SLP	45	3	120	128	M	7	51	Extraction	Premature rupture of membranes. Meconium in liquor amnii. Long first stage. Autopsy.
6	25	3	Justo Minor	OLA	11	[illegible]	145	70	M	6	53	Spontaneous	No cause of death discovered.
7	24	1	Simple Flat	OLA	[illegible]	7	160	160	M	[illegible]	50	Forceps	Child died from pressure during the long labor. Inertia uteri. Mother's pulse 148.
8	21	2	Flat	OLA	14	2	130	70	F	8.5	54	Version	Threatened rupture of the uterus. Child died from compression by the uterine walls.
9	20	2	Flat Justo Minor	ODA	24	3	130	148	F	8	52	Forceps	Induced labor at term. Colpeurynter. Outlet contracted. Fetus killed by the forceps. Autopsy.
10	24	1	Normal	ODA	18	.	1.0	. .	F	6	48	Spontaneous	Hydramnion. Two gallons of liquor amnii. Premature rupture of the membranes.
11	1	1	Simple Flat	OLA	19	[illegible]	[illegible]	130	F	[illegible]	[illegible]	Forceps	Fetal heart irregular in second stage. Meconium in liquor amnii. Premature rupture of membranes.
12	18	1	Normal	OLA	7	2	130	160	M	[illegible]	49	Spontaneous	Hydramnion. Fetal heart irregular after membranes ruptured. Child died from pressure. Autopsy.
13	28	1	Normal	SDA	14	[illegible]	160	[illegible]	M	6	[illegible]	Extraction	Fetal head caught at the inlet in the extraction. Autopsy.
14	23	2	Normal	OLP	18	1	140	140	F	6.5	49	Spontaneous.	Cord wrapped tightly around the body twice.
15	37	6	Flat Justo Minor	FLA	30	12	160	170	M	8	54	Version	Forceps on aftercoming head. Cord pulsating feebly just before version. Prolonged labor. Child died from injury.
16	19	3	Normal	ODP	2	2	140	138	M	7.5	51	Spontaneous	No recorded cause of death.
17	30	1	Normal	ODP	6	6	140	140	F	11	[illegible]	Version	Head was caught at pelvic inlet. Extraction very difficult.
18	18	1	Flat	SLA	17	[illegible]	160	160	M	6	50	Extraction	Head caught at inlet. Autopsy.
19	27	3	Normal	Twins SCDA	1 [illegible]	[illegible]	. . .	. . .	F	7	48	Version	First child alive. SCDA resulted when second membranes ruptured. Child died in ten minutes. Premature detachment of placenta.
20	35	1	Normal	MLA	6	1	160	160	F	[illegible]	[illegible]	Version	Large caput succedaneum.
21	25	1	Normal	SDA	36	[illegible]	148	136	F	8.5	[illegible]	Extraction	Narrow pubic arch. Difficult extraction.
22	37	1	Normal	ODP	9	[illegible]	130	....	M	8.7	[illegible]	Craniotomy	Naegele Obliquity. Accouchement forcè. Version. Child died in extraction. Craniotomy on aftercoming head.
23	24	1	Normal	Twins OLA	10	[illegible]	150	....	M	6.6	[illegible]	[illegible]	Eclampsia. Manual dilatation of cervix. First child alive. Second dead.
24	26	1	Justo Minor	SCDA	24	[illegible]	132	150	M	[illegible]	[illegible]	Version	Elbow in vagina. Prolapsed cord. Shoulder engaged. Internal version difficult. Child died from pressure on cord.
25	19	1	Normal	SDA	[illegible]	[illegible]	144	150	M	[illegible]	54	Extraction	Double breech. Brought down anterior foot. Head caught at inlet.
26	18	1	Simple Flat	SLA	24	6	124	130	M	9	[illegible]	Extraction	Head caught at inlet.
27	37	1	Justo Minor	ODA	96	[illegible]	150	. . .	M	[illegible]	[illegible]	Version	Child died from pressure in the first stage. Premature rupture of membranes. Autopsy.
28	24	1	Justo Minor	OLA	10	[illegible]	142	136	M	[illegible]	49	High Forceps	Eclampsia. Manual dilatation of cervix. Autopsy.
29	20	1	Justo Minor	SCDA	24	[illegible]	160	80	M	6	48	Spontaneous	Child died twenty minutes before delivery from prolapsed cord.
30	19	1	Normal	SLA	8	[illegible]	138	140	M	9	56	Extraction	Child died from difficult extraction. Ecchymoses over body. Autopsy.
31	18	1	. . .	SLA	24	6	142	.	M	[illegible]	[illegible]	[illegible]	Head caught at inlet.
32	26	1	Justo Minor	ODA	8	[illegible]	150	. . .	M	[illegible]	49	Version	Eclampsia. Nephritis. Autopsy.
33	35	8	Flat Justo Minor	OLA	48	[illegible]	160	....	M	[illegible]	[illegible]	[illegible]	High forceps failed. C.V. 8.75 cm.
34	17	1	. . .	ODP	12	1	148	.....	M	6.5	49	Forceps	Mother had lobar pneumonia.
35	35	9	. . .	OLA	40	1-12	[illegible]	. . .	M	5	48	Spontaneous	Meconium in liquor amnii. Child died in long first stage.
36	20	1	Normal	OLA	12	4	136	132	M	6	49	Spontaneous	Child died from hemorrhage into the amniotic sac. Cord twice around neck.
37	20	1	Normal	SLA	23	3	144	160	F	[illegible]	[illegible]	High Forceps	Mother's pulse 140 in the second stage. Child injured in the operation.
38	22	1	Justo Minor	OLA	[illegible]	2	160	160	M	5.7	49	Version	Accouchement forcè. Mother has mitral stenosis. Child injured by the operation.

	37			[illegible]	[illegible]	12	[illegible]	[illegible]	[illegible]	M	[illegible]	54	[illegible]
4	[illegible]	[illegible]		Flat	OLA	[illegible]	[illegible]	[illegible]	280	M	8	[illegible]	[illegible] mouth when delivered
5	[illegible]	[illegible]			CEPH	[illegible]	[illegible]	[illegible]	[illegible]	F	6	40	Version	[illegible] head.
42	[illegible]	[illegible]			ODA	[illegible]	[illegible]	[illegible]	[illegible]	M	[illegible]	[illegible]	[illegible]
43	43	1			SCLA	[illegible]	[illegible]	[illegible]	[illegible]	M	9	57	Version	Head caught at inlet.
44	43	1		Normal	OLA	[illegible]	[illegible]	[illegible]	[illegible]	M	7	[illegible]	[illegible]	Child died in the long first stage.
45	[illegible]	1		Normal	SLA	[illegible]	[illegible]	[illegible]	[illegible]	M	[illegible]	[illegible]	Extraction	Head [illegible] asphyxia.
46	30	1		Normal	Twins OLA	[illegible]	1	140	140	M	6.5	50	[illegible]	First child alive. Second born one hour later with membranes intact. Premature detachment of placenta.
47	39	11		Normal	SLA	[illegible]	[illegible]	[illegible]	[illegible]	M	[illegible]	52	Spontaneous	Intrauterine asphyxia.
48	19	1		Justo Minor	SLA	[illegible]	[illegible]	[illegible]	[illegible]	F	[illegible]	48	Extraction	Child died in the first stage.
49	22	1		Justo Minor	OLA	[illegible]	[illegible]	[illegible]	[illegible]	M	[illegible]	[illegible]	Version	High forceps useless. Head arrested at inlet.
[illegible]	47	[illegible]		Normal	OLA	8	3	[illegible]	[illegible]	M	[illegible]	[illegible]	Version	Prolapse of cord and hand. Child died from pressure on cord.
51	37	3		Justo Minor	OLA	[illegible]	18	[illegible]	150	M	9	[illegible]	Craniotomy	High forceps negative. Version dangerous
52	34	2			CEPH	[illegible]	[illegible]	[illegible]	146	M	[illegible]	55	[illegible]	Prolapse of cord. Version. Forceps on after-coming head. Child died from pressure on cord.
53	2	3			SCLA	60	3	[illegible]	[illegible]	M	8.5	55	Embryotomy	Child died from pressure in the long first stage.
54	20	[illegible]		Justo Minor	OLA	[illegible]	[illegible]	[illegible]	[illegible]	M	6.5	42	Craniotomy	Fetus died from compression of head in the second stage. Meconium in liquor amnii.
55	36	1		[illegible]	ODA	[illegible]	[illegible]	130	[illegible]	F	7.5	[illegible]	[illegible]	Eclampsia. Chronic nephritis. Accouchement forcè.
56	29	2		Normal	OLA	8	7	150	[illegible]	M	8.25	53	[illegible]	Uterine inertia in second stage.
57	38	2		[illegible]	OLA	[illegible]	[illegible]	[illegible]	[illegible]	F	6.25	4	Spontaneous	Fetal motions active in second stage. Premature detachment of placenta.
58	19	1		Rickety	SCDA	18	3	[illegible]	[illegible]	M	[illegible]	[illegible]	Version	[illegible]
59	17	1		Normal	ODA	12	4	140	140	M	11	58	Craniotomy	High forceps negative. Head not engaged. Version dangerous.
60	40	[illegible]		[illegible]	ODA	14	8	130	132	M	7	51	Forceps	Eclampsia. Accouchement forcè.
61	20	1		Flat	OLA	20	1	140	150	M	7.5	52	Forceps	Prolapsed cord.
62	20	2			SCDA	18	2	160	142	F	6.5	50	Version	Premature rupture of the membranes.
63	24	1		[illegible]	SDA	8	[illegible]	18	138	F	7.25	52	Extraction	Rigid perineum.
64	31	1		Flat Justo Minor	MLA	11	[illegible]	148	132	F	[illegible]	54	Spontaneous	Cord wrapped tightly around neck.
65	35	10		[illegible]	SCLP	[illegible]	1.5	150	160	M	[illegible]	49	Version	Placenta previa lateralis. Child died from [illegible]
66	20	1		Rickety	OIMP	48	[illegible]	180	[illegible]	F	8.5	41	Forceps	Several attempts to deliver had been made before patient entered hospital. Child killed during operations.
67	42	1		[illegible]	CEPH	[illegible]	[illegible]	160	150	M	[illegible]	51	Version	Eclampsia.
68	29	1		Flat Justo Minor	OLA	[illegible]	[illegible]	160	[illegible]	F	[illegible]	54	High Forceps	Incisions of cervix. Long first stage.
69	30	8		Normal	SLA	[illegible]	[illegible]	[illegible]	140	M	[illegible]	52	Extraction	Autopsy.
70	28	1		Flat Justo Minor	OLA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
71	20	1		Normal	SLA	[illegible]	[illegible]	132	132	M	8.5	[illegible]	Extraction	No recorded cause of death.
72	25	1		Justo Minor	OLP	20	1	130	[illegible]	M	[illegible]	41	High Forceps	[illegible]
73	17	1		Justo Minor	OLA	[illegible]	[illegible]	[illegible]	[illegible]	F	[illegible]	56	Version	Prolapse of the cord.
74	28	1		[illegible]	SCDP	[illegible]	[illegible]	[illegible]	[illegible]	F	[illegible]	[illegible]	Version	Prolapse of the right arm.
75	[illegible]	[illegible]		Normal	ODA	[illegible]	[illegible]	[illegible]	[illegible]	M	[illegible]	[illegible]	Version	Manual dilatation of the cervix.
76	[illegible]	1		Normal	OLA	[illegible]	3	144	[illegible]	M	[illegible]	[illegible]	Forceps	Uterine inertia. Mother's pulse 130.
77	18	1		Normal	Twins SLA	[illegible]	[illegible]	[illegible]	[illegible]	F	[illegible]	[illegible]	Extraction	Premature detachment of placenta of last child
78	22	1		Normal	OLA	[illegible]	[illegible]	142	144	M	[illegible]	52	Spontaneous	No reported cause of death.
[illegible]	[illegible]	1		Normal	OLA	30	[illegible]	[illegible]	[illegible]	F	6.5	40	Spontaneous	[illegible] shoulder.
80	[illegible]	[illegible]		Normal	OLA	[illegible]	[illegible]	[illegible]	[illegible]	F	[illegible]	[illegible]	[illegible]	[illegible]
81	[illegible]	2		Rickety	OLP	26	[illegible]	[illegible]	[illegible]	F	[illegible]	[illegible]	Spontaneous	No reported cause of death.
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	128	F	[illegible]	40	Spontaneous	[illegible] after. Autopsy
83	27	[illegible]		Justo Major	OLA	6.5	[illegible]	[illegible]	[illegible]	M	[illegible]	[illegible]	Spontaneous	[illegible]
84	18	[illegible]		Normal	SLP	6	[illegible]	[illegible]	[illegible]	M	6	[illegible]	Forceps	Forceps on the aftercoming head.

No. of Case	Age	Para.	Pelvis	Diagnosis	Length of First Stage	Length of Second Stage	Heart Tones First Stage	Heart Tones Second Stage	Sex	Weight of Child	Length of Child	Method of Delivery.	Comment Upon Treatment and Remarks
85	25	1	Normal	ODA	12	*	160		M	7.5		Version	Eclampsia.
86	30	3	Normal	Twins SLA	8	2			M	6.7	40	Spontaneous	First child alive. Second dead. Placenta expelled immediately. Premature detachment.
87	19	1	Normal	OLA	4	2	144	120	F	6.5	50	Spontaneous	Perineum rigid. Cord around neck and tight. Child died from pressure on cord.
88	33	7	Normal	SLA	6	3	.		M	7	54	Extraction	Child delivered to navel when attendants arrived. Cord beating feebly.
89	36	2	Flat	ODA	17	8	160	140	M	7	52	Craniotomy	Litzmann's Obliquity. Forceps negative.
90	27	1	Flat Justo Minor	OLA	45	5	128		F		48	Spontaneous	Left [illegible]
91	28	5	....	SLA	4	3		140	M	8	56	Extraction	[illegible] the neck. Circumference of shoulders 43 cm.
92	32	5	Flat Justo Minor Rick	OLA	6	3	160	140	M	8	52	Craniotomy	Naegele's Obliquity. C.V. 8¼ cm.
93	30	9	....	OLA	2	½		144	F	6.5	49	Spontaneous	Death due to short cord. Much fresh meconium in liquor amnii.
94	32	5	Normal	Twins ODP	8	4	150		M	5	48	Spontaneous	First child alive. 45 minutes later second child [illegible] placenta.
95	27	3	Justo Minor	SCDP	8	4	140		F	7	54	Version	Operation was performed too late.
96	27	2	Justo Minor	ODP	10	3	120		M	7.2	50	Spontaneous	Premature rupture of the membranes. Child alive until a half hour before delivery.
97	22	1	Normal	OLA	9	1½	144	148	M	6	49	Spontaneous	Dry labor. Premature rupture of the membranes.
98	40	7	Normal	MLA	8	6	140	140	M	9	58	Porro operation	Rupture of the uterus. Craniotomy. Porro Death of mother.
99	28	20	Justo Minor	OLA	12	2	132	136	F	8	57	Craniotomy	Version and forceps negative.
100	25	2	Justo Minor	ODA	17	13	160	150	F	11	54	Craniotomy	[illegible] Hydramnios.
101	24	2	Flat	CEPH	11	4¼	140	140	F	8.5	48	Craniotomy	Child died from pressure in the second stage.
102	36	9	Normal	ODP	14	¼			M	10	54	Spontaneous	Pendulous abdomen. Placenta detached. Child died in three hours.
103	37	9	Normal	SDP	8	3	150	160	M	8.5	49	Extraction	Left [illegible] Cord [illegible] Dead.
104	34	9	Rickety	OLA	20	3	120		M	8.2	55	Version	Litzmann's Obliquity. Velamentous insertion of cord. Child lost in the extraction.
105	35	5	Normal	OLA	16	2	144		M	8	48	Spontaneous	Child died in one hour. Funic souffle.
106	40	4	Normal	Twins ODP	5	2 1/2			F	7	55	Spontaneous	First child alive. Midwife gave ergot to increase pains. Uterus hard and contracted.
107	30	8	Normal	ODP	[illegible]	[illegible]	150		M	8.5	52	Spontaneous	Cord [illegible] in liquor amnii. Fresh meconium in the liquor amnii.
108	30	6	Normal	ODA	18	2	120	160	M	9	54	Spontaneous	Child died on the second day of atelectasis pulmonum.
109	40	2	Normal	ODP	7	½	150	..	F	7	54	Version	Prolapse of cord. Braxton Hicks version. Child died in the extraction.
110	22	2	Flat	OLA	30	4	120	150	F	5.5	51	Spontaneous	Premature detachment of the placenta.
111	29	3	Justo Minor	ODA	24	1	150	160	M	8	48	Spontaneous	Meconium in liquor amnii. Child died in three hours.
112	34	12	Normal	MLA	12	2	[illegible]	108	M	7	48	Forceps	Version tried but failed. Child died shortly after birth.
113	30	5	Flat	SCDP	7	2½	128	104	M	6.7	52	Version	Hydramnion. Placenta delivered with child.
114	39	10	Flat	SLA	7	4½	128	132	M	12	58	Version	Hydramnion. Fetal head well ossified. Child died in ten hours.
115	23	1	Flat Justo Minor	OLA	28	13	132	148	M	7	55	Craniotomy	Litzmann's Obliquity. Head [illegible] forceps negative.
116	35	10	Flat	SCLP	11	½	132	150	M	7.2	52	Version	Fresh meconium in liquor amnii. Braxton Hicks version. Child died in six hours.
117	34	6	Normal	OLA	...	3	160	..	F	7	50	Version	Placenta previa lateralis. Hands and feet present with the head. Prolapse of the cord.
118	26	2	Flat Justo Minor	ODP	12	¾	140	150	M	9	52	Spontaneous	Cord once around neck.
119	28	3	Normal	SCDA	35	1½	160	160	F	7	49	Version	Long first stage. Version easy. Child died the following day.
120	38	12	Rickety	CEPH	7	10	120	120	M	8	53	Craniotomy	Naegele's Obliquity. Version and high forceps negative. Fracture of left parietal bone.
121	36	8	Normal	OLA	17	5	132	130	F	10	53	Forceps	Low forceps after five hours in second stage. Enormous angioma of child.
122	26	2	Normal	SCLA	36	....	142	[illegible]	½	7.5	52	Version	Braxton Hicks version.
123	31	6	Flat	ODA	9	1.7	152	160	M	7.5	50	Evisceration	Hydramnion. Pendulous abdomen.
124	29	1	Justo Minor	ODA	7	1.5	128	.	F	7.1	51	Craniotomy	Hydramnion. Prolapse of cord. Version negative.
125	24	2	Flat	OLA	17	1½	152	144	M	9.5	48	Extraction	Cause of death unknown.

														Method of Delivery.	
[illegible]	[illegible]	[illegible]	Flat	SDA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	M	[illegible]	[illegible]	[illegible]	[illegible]
117	[illegible]	1	Flat Justo Minor	SLP	4.5	1	[illegible]	140	[illegible]	M	[illegible]	[illegible]	[illegible]	Extraction	Trachea full of mucus. Difficult extraction. Head caught at inlet.
118	[illegible]	1	Normal	OLA	8.5	[illegible]	[illegible]	135	[illegible]	I	7	[illegible]	51	Spontaneous	[illegible] neck. Pains almost continuous in the second stage.
120	[illegible]	1	Rickety	OLA	[illegible]	.7	[illegible]	140	60	M	7	[illegible]	[illegible]	Forceps	Marked moulding of head. Very difficult extraction. Child died in labor.
13	[illegible]	1	Normal	OLA	20.7	.3	[illegible]	[illegible]	[illegible]	M	[illegible]	[illegible]	49	[illegible]	Manual dilatation of cervix. Uterine inertia
121	35	6	Flat	SDA	[illegible]	7	[illegible]	140	[illegible]	M	[illegible]	[illegible]	[illegible]	Extraction	Breech impacted. Forceps on after-coming head. Heart beat for a short time.
122	[illegible]	7	Justo Minor	ODA	10	4	[illegible]	140	80	F	[illegible]	[illegible]	49	Version	Prolapse of cord. Manual dilatation.
123	[illegible]	1	Justo Minor	ODA	9	[illegible]	[illegible]	146	90	M	[illegible]	7.5	[illegible]	[illegible]	Prolapse of cord. Version negative.
124	29	5	Normal	ODP	[illegible]	9	[illegible]	130	[illegible]	[illegible]	M	8.7	[illegible]	Version	Low forceps negative. High forceps negative Sutures overlapping. Depression of frontal bone
125	40	7	Normal	Twins OLA	17	9	[illegible]	[illegible]	140	I	6.7	48	Spontaneous	First child alive. Second born nine hours later	
126	[illegible]	[illegible]	Justo Minor	OLA	20	14	[illegible]	144	[illegible]	F	[illegible]	[illegible]	49	Evisceration	Head would not enter inlet. High forceps negative. Cleidotomy.
127	19	1	Normal	OLA	13	13	[illegible]	144	144	M	[illegible]	[illegible]	53	Spontaneous	Coil of cord prolapsed at the side of head.
128	26	5	Flat Justo Minor	CEPH	2.3	8	[illegible]	130	138	M	[illegible]	[illegible]	[illegible]	Craniotomy	[illegible]
129	35	8	Normal	OLA	15	3	[illegible]	144	[illegible]	M	[illegible]	[illegible]	58	Extraction	[illegible] bladder. Mother died in half an hour
130	27	8	Normal " "	Twins OLA	[illegible]	3	[illegible]	[illegible]	[illegible]	M	7	[illegible]	51	Spontaneous	First child alive. Second born in half an hour. Placenta and membranes intact. Premature detachment.
131	26	6	Normal	OLA	[illegible]	[illegible]	[illegible]	[illegible]	7	M	[illegible]	[illegible]	52	Spontaneous	No cause of death discovered.
132	34	9	Normal	OLA	6	5.5	140	[illegible]	[illegible]	M	[illegible]	[illegible]	58	Version	Weak pains in the second stage.
133	27	2	Normal	SDA	33	4	[illegible]	[illegible]	[illegible]	M	[illegible]	[illegible]	51	Craniotom	Prolapsed cord. Manual aid
144	26	6	Flat Justo Minor	ODA	11	3	[illegible]	140	[illegible]	M	[illegible]	8.5	[illegible]	Spontaneous	Prolapsed cord. Asphyxia.
145	40	8	Normal	ODP	11	15	[illegible]	138	[illegible]	M	[illegible]	[illegible]	[illegible]	Craniotomy	Large caput. High forceps negative. Double cleidotomy.
146	30	7	Normal	OLA	4	3	[illegible]	140	60	F	[illegible]	[illegible]	53	Spontaneous	Cord three times around neck. Meconium in liquor amnii. Child lived five minutes.
147	27	3	Justo Minor	SCDP	[illegible]	4	[illegible]	150	150	M	[illegible]	[illegible]	[illegible]	Version	Great difficulty with head at inlet. Smellie Veit and Kristeller methods.
148	[illegible]	1	Justo Minor	ODP	15	3	[illegible]	130	144	M	[illegible]	[illegible]	53	Spontaneous	Cord twice around neck. Child alive until half an hour before delivery. Premature rupture of membranes.
149	30	1	Normal	OLA	9	1	[illegible]	142	[illegible]	I	[illegible]	[illegible]	[illegible]	Spontaneous	Cord once around neck, tight. Meconium in liquor amnii. Perineum rigid. Child killed by pressure on cord.
150	30	3	Justo Minor	Twins SLA	6	3	[illegible]	[illegible]	[illegible]	M	6.7	[illegible]	Spontaneous	Second child born two and a half hours after first Placenta expelled immediately.	
151	[illegible]	7	Normal	SLA	7	[illegible]	[illegible]	[illegible]	130	M	[illegible]	[illegible]	[illegible]	Spontaneous	Child born to navel when attendant arrived. Fa in pulsation of cord.
152	27	1	Normal	ODA	18	6	[illegible]	[illegible]	130	M	6	[illegible]	48	Spontaneous	Old ventrofixation for retroversion. Cervix high and posterior.
153	39	9	Normal	OLA	2	[illegible]	[illegible]	144	[illegible]	F	[illegible]	[illegible]	[illegible]	Spontaneous	Short cord once around neck, tight. Meconium in liquor amnii. Child died twenty minutes before delivery.
154	[illegible]	0	Justo Minor	SCDA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	M	[illegible]	[illegible]	52	Version	Prolapse of cord. Version. Spontaneous delivery
155	35	4	Flat	SDA	15	[illegible]	[illegible]	140	140	F	[illegible]	[illegible]	55	Spontaneous	Shoulders impacted in pelvis. Bisacromial circumference 30 cm.
156	[illegible]	[illegible]	[illegible]	ODP	[illegible]	[illegible]	[illegible]	[illegible]	144	M	[illegible]	[illegible]	48	Spontaneous	Rapid second stage. Pains strong and continuous. Child died in eight hours.
157	[illegible]	1	Flat Justo Minor	OLP	10.5	.5	[illegible]	140	[illegible]	I	[illegible]	[illegible]	[illegible]	Forceps	Manual dilatation. Child two weeks overtime and lived four hours.
158	[illegible]	1	Flat	CEPH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	M	6	[illegible]	[illegible]	Forceps	Deep transverse arrest. Meconium in liquor amnii. Incomplete rupture of the uterus. Mother died
159	[illegible]	[illegible]	Rickety	ODP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	F	[illegible]	[illegible]	51	Craniotomy	Naegele Obliquity. Version negative. Osteomalacia.
160	[illegible]	3	Flat	OLA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	M	8.7	54	Forceps	Meconium in liquor amnii. Child died from pressure.	
161	[illegible]	3	Normal	SCDA	[illegible]	[illegible]	Slow	[illegible]	[illegible]	F	[illegible]	[illegible]	[illegible]	Version	Prolapse of cord. Large retroplacental blood clot
162	26	3	Normal	ODA	[illegible]	7	[illegible]	142	[illegible]	I	[illegible]	[illegible]	51	Craniotomy	Prolapse of cord, at first pulsating freely. Later no pulse.
163	[illegible]	4	Justo Minor	ODA	[illegible]	[illegible]	[illegible]	[illegible]	128	M	[illegible]	[illegible]	52	Craniotomy	Naegele Obliquity. [illegible] uterus. [illegible]

No. of Case	Age.	Para	Pelvis	Diagnosis	Length of First Stage	Length of Second Stage	Heart Tones First Stage	Heart Tones Second Stage	Sex	Weight of Child	Length of Child	Method of Delivery	[illegible]
164	21	1	Flat	ODA	25	5	142	140	M	5	50	Spontaneous	Heart tones ceased one hour before delivery. Liquor amnii bloody.
165	29	2	Normal	ODA	16	2	14[illegible]	14[illegible]	M	8.5	53	Spontaneous	Cord around neck tight. Heart tones inaudible one half hour before delivery.
166	24	1	Normal	ODP	15	4	135	.	M	7	50	Forceps	Forelying cord. Reposition negative. Difficult forceps.
167	28	4	Rickety	OLA	10	1	142	140	F	7	52	Spontaneous	Prolapse of the cord.
168	25	4	Justo Minor	ODA	12	5	[illegible]	[illegible]	F	12	52	Forceps	[illegible] traction of the shoulders.
169	19	1	Flat Justo Minor	SDA	19	1.5	1[illegible]		M	8.3	51	Extraction	Child lost in the extraction.
170	33	5	Rickety	ODP	[illegible]	[illegible]	[illegible]	144	M	8.5	50	Version	Prolapse of cord. Pulsation of cord ceased during version.
171	32	1	Flat Justo Minor	OLP	24	8	[illegible]	168	M	8.[illegible]	[illegible]	Craniotomy	Posterior parietal bone presented. Prolapse of cord. Head arrested at inlet.
172	24	1	Justo Minor	OLA	41	4	1[illegible]	14[illegible]	M	0.3	35	Forceps	Head dolicocephalus. Mother's pulse 120.
173	22	1	Flat	OLA	1	1-6		160	F	7.[illegible]	49	Spontaneous	Cord once around neck. Precipitate labor. Child born with [illegible]
174	30	1	Normal	OLP	[illegible]	[illegible]	[illegible]	132	M	7.[illegible]	50	Spontaneous	No record as to child's death.
175	28	2	Flat	SCDA	12	5	1[illegible]	150	M	9	54	Forceps	Premature rupture of membranes. Colpeurynter. Head arrested at inlet by osteoma on promontory.
176	31	4	Normal	OLA	18	7	1[illegible]	136	M	8.[illegible]	52	Forceps	Uterine inertia in second stage. Child gasped and died.
177	28	2	Rickety	FLA	24	9	.	1[illegible]	M	[illegible]	58	Forceps	Manual rotation negative. Threatened rupture of uterus. Mother's pulse 148. Child lived eighteen hours.
178	25	2	Normal	OLA	9		141	[illegible]	F	8	51	Version	Placenta previa centralis. Braxton-Hicks version. Slow extraction.
179	23	1	Flat	ODP	.	9	....	....	M	7.7	50	[illegible]	Placenta previa centralis. Colpeurynter pushed head through uterus. Mother and child died.
180	27	3	Normal	ODP	....	4	....	....	M	9	52	Laparotomy	Mistake gave ergot to hasten labor. Rupture of uterus. Child in peritoneal cavity. Mother died of sepsis.
181	18	1	Rickety	MLP	12	8	150	1[illegible]	M	8.5	52	Craniotomy	Manual rotation negative.
182	40	1	Flat	CEPH	48	18	1[illegible]	80	M	9	56	Craniotomy	Prolonged second stage.
183	24	2	Flat	ODP	14	6	1[illegible]	80	F	8.5	50	Craniotomy	Manual rotation negative. Version dangerous. Craniotomy very difficult.
184	26	2	Normal	ODA	12	3	1[illegible]	....	M	8.7	54	Version	Head remained high. Attempted version. Cord caught in version slings and child died.
185	28	3	Flat	SCDA	7	.7	144	1[illegible]	F	9.3	54	Decapitation	Membranes ruptured in first stage. Shoulder became impacted. Unable to perform version.
186	18	1	Normal	ODA	12	3	1[illegible]	110	M	7.5	50	Craniotomy	Placenta previa marginalis. Acute anemia Craniotomy of child. Mother died in one hour.
187	28	4	Normal	ODA	0	5	1[illegible]	....	M	8	54	Version	Placenta previa marginalis. Braxton Hicks version. Slow extraction.
188	30	4	Rickety	ODP	....	10	140	?	M	8.5	52	Craniotomy	Hand in nape of neck. Several attempts already made at version and forceps. Cleidotomy.
189	20	1	Rickety	OLA	14	6	1[illegible]	1[illegible]	M	8	54	Craniotomy	Rickety negress. Naegele Obliquity. Threatened rupture of uterus. Forceps useless.
190	24	2	Justo Minor	ODA	18	7	132	140	F	8.7	54	Craniotomy	Uterine inertia in second stage. Mitral stenosis Head high above inlet. Lower uterine segment thinned. High forceps negative.

The following is a brief summary of the autopsies made on the bodies of 33 stillborn children.

Case 1. Diffused subpleural ecchymoses, especially anteriorly and laterally in both lungs. Alveoli filled with bloody serum. Slight crepitation. Many air cells collapsed. Several hemorrhages in both lungs. Numerous punctate hemorrhages beneath the capsule of liver. There is a large clot and a moderate amount of fluid blood beneath the dura mater on the entire right side of skull. The fluid blood spurted out when released. Superficial hemorrhage in cerebellum.

Case 3. Abrasion of skin over occiput and right temporal region. Subpleural hemorrhages. Large hemorrhage in interlobar fissure of left lung. Both lungs hemorrhagic and congested. Spleen congested. Large cephalhematoma over right parietal bone. Brain soft. In posterior and middle fossa of skull is considerable blood. Subdural hemorrhage over parietal bone of left side.

Case 5. Right lung poorly expanded. Left lung less so. Subcapsular hemorrhage in liver. Patent ductus arteriosus and foramen ovale.

Case 9. Three forceps marks on scalp. Lungs congested and hemorrhagic. Over both parietal bones is a thin layer of blood. Frontal bone is fractured over an area of one and a half inches. Dura mater beneath is congested. Fracture of roof of left orbit. Hemorrhage in Sylvian fissure. One ounce of blood in lateral

ventricles. Slight hemorrhage in floor of fourth ventricle.

Case 12. Considerable mucus in larynx and bronchi. Dark and bloody areas in right lung. Both lungs float. Large blood clot extends nearly through the right lung. Kidneys are congested and hemorrhagic. Liver hemorrhagic and the capsule is stripped up in places.

Case 13. Hemorrhage in cellular tissue of buttocks and thigh. Hemorrhage in lower third of right sternomastoid muscle. Hemorrhage on surface of brain, at junction of middle and posterior thirds, near longitudinal fissure. A large quantity of blood under right parietal bone. Lungs collapsed; do not float. Slight hemorrhage under capsule of liver and kidneys.

Case 18. Lungs collapsed and full of blood. Large amount of blood in scalp tissue. Subdural hemorrhage on right side. Brain soft. Mass of blood at base of brain. Lateral ventricles free.

Case 22. Small blood clot in mediastinum. Ecchymoses of bladder. Large hemorrhage in anterior parietal region under scalp. Small hemorrhage between layers of tentorium and in falx cerebri. Pancreas and kidneys congested.

Case 27. Hemorrhagic diathesis. Multiple subserous hemorrhages. Effusion of blood beneath scalp. Petechiæ under pia mater. Blood clot between falx cerebri and hemisphere of either side. Pericardial ecchymoses.

Case 30. Blood extruding from both nostrils. Edema of lungs dark red ecchymoses. Partial atelectasis. Over right frontal eminence is an extravasation of blood in scalp. Hemorrhage in both posterior fossæ of brain, beneath tentorium cerebelli. Ecchymoses under skin, at various points.

Case 31. Head moulded. Considerable blood in both pleuræ. Pharynx contains mucus. Subpleural hemorrhages. Lungs are atelectatic. Spleen congested. Liver hemorrhagic. Dark blood clot extending full length of brain on right side between dura and pia mater.

Case 32. Thymus enlarged. Hemorrhagic infarcts of both lungs. Subpleural ecchymoses. Pulmonary atelectasis. Acute endocarditis of right heart.

Case 35. Congenital atelectasis of both lungs. Liver enlarged. Free blood beneath capsule. Blood oozes on section. Free blood below scalp. Brain edematous.

Case 39. Complete atelectasis of both lungs. Hematothorax; hemato-pericardium; hematoperitoneum. Passive congestion of liver, spleen and kidneys. In suboccipital region of brain is a mass of dark clotted blood (extra dural), size of small walnut. Vessels over surface of brain congested. Outside of skull in same region, is a mass of clotted blood. Dark fluid blood over superior and posterior surface of both parietal bones.

Case 43. Lower border of lungs congested. Many collapsed areas. Liver hemorrhagic. Small amount of blood in pericranial tissues. Free blood in cranial cavity over posterior portion of brain. Free blood at base of skull. Subdural hemorrhages.

Case 44. Thymus extends to the diaphragm. Lower lobes of lungs congested. Cerebral vessels congested. Subpericardial hemorrhage. Foramen ovale patent.

Case 49. Depression over right parietal bone. Free blood in pleural cavities. Free blood in pericardial cavity, lungs, spleen, gall-bladder and pancreas. Lungs atelectatic.

Case 52. Considerable free blood in abdominal, pleural and pericardial cavities. Both lungs collapsed Eccyhmoses anteriorly. No crepitation. Subperi cranial hematoma. Meninges covered with blood Hemorrhage in kidneys. Liver diffusely hemorrhagic

Case 56. Right lung feebly crepitant. Posterior border bloody. Alveoli collapsed. Pyramids of kid neys much congested. Liver, spleen and thymus markedly congested.

Case 57. Lungs collapsed. Slight crepitation. Frothy blood and green serum exude on cut section. Patent foramen ovale. Atelectasis of lungs. Passive congestion of kidneys.

Case 61. Atelectasis of both lungs. Hemorrhages beneath capsule of kidneys. Cortex and medulla show congestion.

Case 65. Left leg bluish. Nearly whole of upper surface of right lobe of liver is covered with a clot raising the capsule. Kidneys congested. Supra-renals congested. Both lungs congested at bases. Hemorrhage in right lung. Subpleural ecchymoses. Marked edema of brain. No hemorrhage.

Case 68. Hare lip. Superitioneal ecchymoses. Perforation of Meckel's diverticulum. Free meconium in peritoneal cavity. Large amount of fluid and clotted blood on right side of brain (subdural). Large blood clot over frontal lobe.

Case 69. Parietal bones depressed. Irregular hemorrhage in scalp. Hemorrhage on surface of brain, subdural and at base. Blood in right lateral ventricle. Intestines congested, little meconium. Hemorrhage beneath capsule of lobus quadratus. Spleen congested. Left lung dark from hemorrhage into its tissues. Neither lung crepitant.

Case 73. Dark fluid blood in both lungs. Foramen ovale patent. Passive congestion of the lungs, liver and spleen.

Case 76. Bruise over malar region on right side of face. Kidneys congested. Head markedly moulded. A large subdural hemorrhage on left side of surface of brain. Excess of fluid in lateral ventricles. Lungs non crepitant. Considerable mucus in trachea and throat.

Case 80. Bruise on right side of head. Brain firm. Vessels much congested. Hemorrhage at base of brain, extending over pons and medulla. Extra dural hemorrhage beneath the occipital bone. Spleen congested. Pyramids of kidneys nearly black. Lungs collapsed.

Case 83. Lungs congested. Hemorrhages in bases. Subpleural ecchymoses. Liver enlarged. Subcapsular hemorrhage in right lobe. Considerable yellow fluid in peritoneal cavity.

Case 175. Subcutaneous ecchymoses in various parts of the body. Lungs congested, no hemorrhages. Yellow fluid in peritoneal and pleural cavities. Liver

and kidneys covered by punctate hemorrhages. Right parietal bone depressed by groove one inch wide and two and a half inches long. No fracture. Subdural hemorrhage running along entire right side of brain. Small clot on base. Pia mater apoplectic. Lateral ventricles filled with a small amount of fluid blood. Brain tissues edematous. Few cortical hemorrhages.

Case 176. Intense congestion of kidneys. Suprarenals congested. Anterior border of right lobe of liver congested. Lungs atelectatic. Lungs do not float. Meninges markedly edematous, especially over temporo-sphenoidal lobes. Vessels around medulla and cerebellum congested. Hemorrhage in tentorium cerebelli.

Case 177. Child had several spasms before death. Autopsy on head only permitted. No fracture or depression of bones of skull. Pia mater congested. Base of skull filled with dark fluid blood on both sides, extending up as far as the Sylvian fissure on right side. Lateral ventricles filled with blood tinged serum. Brain tissue soft, exceedingly friable and edematous. Choroid plexuses congested.

Case 180. No subcutaneous ecchymoses. Intense congestion of pyramids of both kidneys and supra-renals. Lungs are atelectatic. Subpleural ecchymoses. There is a hemorrhage at the base of the brain on both sides of skull. Congestion of pia mater and choroid plexuses. Lateral ventricles distended with bloody serum. Brain tissue soft and friable. The changes in the brain are due to head pressure by the uterine walls.

Case 187. Slight ecchymoses on lower limbs. Edema of kidneys. Lungs filled with greenish fluid. Subpleural ecchymoses. Edema of brain. No hemorrhages. Fluid in pleural cavities slightly tinged with blood.

The fetus maintains its life in utero by a constant interchange of gases and nutriment through the medium of the placenta. Pulmonary respiration is held in abeyance and the fetal lungs contain only sufficient blood to aid in the normal development of the organs. The fetus is physiologically apnœic. Only when the respiratory center in the medulla is irritated by a lack of oxygen in the fetal blood are the lungs called into action. Numerous experiments have been made to test the truth of this statement. Henricius exposed a fetal dog by abdominal section, but did not remove it from the uterus. He then forced a solution of ammonia and water into the nose with a pipette. There was a strong reaction of the nose and surrounding skin. Then the mouth was opened and the solution poured into the throat. The animal made swallowing efforts and protruded the tongue, but made no effort to breathe. Only after taking the animal out of the uterus was respiration established. It was found to be impossible to maintain apnœa after the animal was wholly or partially removed from the uterine cavity. The contraction of the uterine walls interfered with the placental circulation.

At the present time, while many theories have been given by various authors as to the real cause of fetal respiration, it is generally conceded that the irritation of the respiratory center is due to a lack of oxygen and excess of carbon dioxide in the fetal blood, and this condition is generally caused by some interference with the placental or funic circulation.

The pathology of fetal death during labor is divided into the changes produced by pure asphyxia, and those produced by the mechanism of labor or operative delivery. Interference with the placental circulation finally results in an increasing venosity of the fetal blood that irritates the center in the medulla, and the fetus reacts by breathing. As the chest expands, liquor amnii, blood, or mucus are drawn into the larynx and bronchi; the pulmonary vessels dilate, and receive a larger portion of blood from the right ventricle. The descending aorta receives a correspondingly lesser quantity through the ductus Botalli. The tension in the arterial system falls, and the placental circulation weakens. Each attempt at respiration increases the difficulty, until the center loses its activity and breathing ceases. The fetal heart beats for a few minutes, and the child becomes still.

If the obstruction is speedily removed, the disturbance may subside, and, according to Schultze, intra-uterine apnœa will return. The respiratory center and the pneumogastric nerve become fatigued through constant irritation, the lungs become inactive, and the pulse increases in frequency. The tension in the descending aorta and umbilical arteries rises, the placenta fills with blood, and its circulation becomes normal.

Sudden death can and does occur without intra-uterine respiration, and the child is born still in apnoea. Severe compression by the forceps, extraction through a contracted inlet, or a hemorrhage at the base of the brain, involving the medulla, will so injure the respiratory center that it is unable to react to stimuli and cause premature respirations.

On the other hand, a slow increase in the impoverishment of oxygen will irritate the medulla continually, but not to such an extent as to produce respirations. By the time that the lack of oxygen is sufficient to act as a stimulus, the irritability of the centre is so decreased that it fails to react.

Owing to the delicate condition of the blood-vessels of the new born child, we would naturally expect hemorrhage to play an important part in the pathology of asphyxia. The meninges, lungs, liver, kidneys, and suprarenals are commonly the seat of congestions or of actual hemorrhages. The more gradual the asphyxia, the more frequently do we find congestion and edema. In a sudden arrest of the funic circulation, as from prolapse of the cord, hemorrhages, and extravasations of blood and bloody serum in the various tissues of the body, are common. In an apparently normal and spontaneous delivery, enormous hemorrhages may be found.

If the fetus dies in utero without respiratory efforts, a general atelectasis will be found. The blood is dark and fluid. There is engorgement of the right heart, the sinuses of the dura, and the vessels of the pia mater. Subcapsular hemorrhages of the liver are not rare. The sudden increase of pressure in the hepatic vessels is due to the overfilling of the right ventricle and inferior vena cava by the efforts at premature respiration. Serum is present in the pleural, pericardial, and peritoneal cavities. The lungs contain little blood, except what may be squeezed from the larger arteries.

If respirations have taken place, the subpleural ecchymoses of Roederer are extremely common. The air passages are filled with liquor amnii, particles of vernix caseosa, or lanugo hairs. The air vesicles may be filled with a greenish fluid which can be pressed out from a cut section. A variable amount of air will often be found present in the lungs. This air is introduced into the uterus during an examination or operation. Fluids may also be forced through the Eustachian tubes into the middle ear, and produce a hyperemia of the parts. A portion of meconium has usually been forced from the intestines by the increased peristalsis, and is found in the liquor amnii, lungs, or rarely, in the stomach.

The more common pathological findings occur in bodies of children who have been injured by the mechanism of labor or by an operation. In a generally contracted pelvis, the fetal head is subjected to a long-continued, generalized pressure, while in the flat or rachitic variety, the projection of the sacral promontory causes the spoon-shaped depressions or fractures of the posterior parietal bone with cerebral hemorrhage below the seat of injury. The application of the forceps to the head at the pelvic inlet leads to fractures, hemorrhages, and lesions of the soft tissues. The same can be said of the extraction of the after-coming head caught at the inlet. It requires considerable obstetric judgment to determine whether a child will suffer more injury from compression by a deformed pelvis than by a forceps operation. The presence of contusions, fractures, and dislocations in other portions of the body, combined with serious lesions, in the form of hemorrhages in the vital organs, and atelectasis of the lungs, is frequently sufficient to turn the scale against the child.

Death of the mature fetus in labor may be ascribed to one or more of the following principal conditions:

Precipitate Labors. Excessive and violent uterine action is seen when the obstruction to the passage of the fetal head is not abnormally great, and when the uterine muscle has not become exhausted by previous long and difficult labors. Either the fetus is small, or the passages are relaxed and easily distensible, and the child is suddenly expelled with great force into the world. The powers of labor may be violently aroused by an early rupture of the membranes, or other local irritation, or by the administration of drugs, notably ergot and quinine. If the uterine contractions are continuous during the latter part of the second stage, the child is likely to become deeply asphyxiated, or perish. The injuries received by the child in being precipitated to the floor are exaggerated. Outside of bruises and contusions, few children suffer from these injuries. While the cord is often torn, hemorrhage from it is the exception. Only one mother was classed as precipitate in this series, and in her case the pains were violent and prolonged.

Prolonged Labor. The evil effects of prolonged labor, to both mother and child, are well known. Prior to the rupture of the membranes, the fetus can safely endure tedious labor for a considerable length of time. Tarnier reported 133 such cases when the first stage lasted from 24 to 60 hours, and only eight children were born still. With the escape of the liquor amnii, however, time becomes an important element, and the fetus soon suffers from the effect of direct intra-uterine pressure. The great danger of premature rupture of the membranes, and its resulting rigidity of the cervix, is shown by the fact that it occurred in 96 of my cases (50.57 per cent). Uterine inertia is especially harmful when the head is well down on the perineum and the body partially escaped from the uterine cavity. The farther the child is expelled from the uterus, the greater is the muscular retraction of its walls, and the more urgent is the indication for immediate delivery.

The normal length of the second stage is difficult to determine, as the conditions influencing fetal life are so varied. It depends upon the size, vitality, and position of the child, the pelvic passages, the powers of labór, and the degree of intra-uterine pressure. The length of labor that the individual fetus can safely endure must be determined by frequent auscultation of the heart tones, and this stage should be terminated when evidence of threatened asphyxia presents. We would naturally expect this stage to last longer in a generally contracted or rachitic pelvis than in a normal or justo major one. The fetal head passing through the pelvis as a face or brow will require more time than would an occiput anterior. The rule to interfere, after a certain number of hours have passed, regardless of the conditions or resistances to be overcome, is a hazardous one. The condition of the child and mother gives the indication for operative delivery, not the element of time. Taking four hours as the usual length of the second stage, we find 32 mothers (16.84 per cent) had prolonged labor. Of this number, 18 children died as the direct result of intra-uterine pressure.

Size of the Child. The size of the child adds to the difficulty of labor. Although dystochia from this cause is dependent upon the relation of the head and shoulders to the pelvis, still large children usually require longer and harder labors. Generally, a child weighing eight pounds or less will not cause dystochia, from size alone, in a normal pelvis, but one of greater development will meet with more or less resistance. If the pregnancy is prolonged, the head becomes larger and harder, and many children are lost as a result of lack of moulding, of the tendency of the occiput to rotate posterior, of the various deflexion attitudes, as well as the difficult and dangerous deliveries by the forceps. If the shoulders are of great size, the child may be lost by excessive traction on the neck. While haste may be indicated because of threatened asphyxia, it is better to wait for labor pains, to perform Kristeller expressions, and, if necessary, to do an episiotomy, than to exert too much traction on the head and neck. In 6 cases of this series, the shoulders were enlarged so that cleidotomy became necessary. One child measured 43 centimeters around the shoulders and weighed 12 pounds; another measured 41 centimeters and weighed 10.5 pounds. Three children weighed 12 pounds and were the heaviest of the series. One hundred weighed less than 8 pounds; 54 weighed between 8 and 9 pounds; 24 from 9 to 10 pounds, and 16 weighed over 10 pounds. Of these 16 children, with 3 exceptions, all the mothers were multiparæ.

The size of the child is also influenced by its sex, boys being heavier and larger than girls. Of the present series, 129 (67.89 per cent) were boys. Of the 15,542 stillbirths reported at the Chicago Health Department, 8,934 (57.50 per cent) were males. Schultze, from tables of nearly 4,000,000 deliveries in Germany, reported one death in 29 male, to 35 female, births.

Pelvic Deformity.

TABLE OF PELVES.

Description	Number of Cases	Percentage
Normal	80	47.32
Generally contracted	30	17.84
Simple flat	27	15.94
Rachitic	14	8.26
Flat, generally contracted	16	9.46
Generally enlarged	2	1.18
Not recorded	21	

One of the principal causes of death in labor is due to deformity of the pelvis, and it is interesting to note that 89 pelves (52.68 per

cent) were classified as deformed and interfering with the normal mechanism of labor. There were but 19 spontaneous deliveries. Of the 80 normal pelves, there were 20 malpresentations, 14 being breech labors.

Williams claims that a spontaneous delivery may be expected in from 75 to 80 per cent of all cases of deformed pelves, and that of the operative cases, radical surgical procedures will be necessary in one-third, and the other two-thirds may be terminated by forceps, version, or craniotomy on the dead child. Baisch, from Döderlein's clinic, reports a fetal mortality of 5.4 per cent in deformed pelves, with from 70 to 80 per cent of spontaneous deliveries by following out the more expectant line of treatment. In the clinics of Fritsch, Crobak and Braun, who freely employed premature labor, high forceps, and prophylactic version, the fetal mortality was 13.2, 18.2 and 34.3 per cent, respectively. The percentage of spontaneous labors in these clinics were 66, 64.5, and 37, respectively. The fetus is better able to stand a moderately prolonged pressure by a deformed pelvis than the sudden manipulation of high forceps or prophylactic version. The injuries received by the head at the inlet are frequently mortal, whether caused by the forceps or in extraction by the breech. In 19 out of 65 cases, where extraction was made on the breech, the head was caught at the inlet and the child lost. In 13 cases, the high forceps were used at or above the inlet without result, save that of further injuring the fetus, and making craniotomy a necessity. In 6 other cases, the high forceps were instrumental in delivering a dead child. Autopsies held on these children showed almost uniformly large hemorrhages of the brain and frequent fractures of the skull. Many children are lost in labor because extraction *per vias naturalas* is impossible, or causes mortal injury. The performance of premature labor, pubiotomy, and Cæsarian Section, when the indications are strictly drawn, will result in greatly lowering the fetal mortality. Pubiotomy will be especially useful in the cases seen for the first time in labor where, because of deformity, the alternative is craniotomy on the living child, and the conditions for Cæsarian Section are absent.

TABLE OF PRESENTATIONS AND POSITIONS

Occipito læva anterior	62	31.25
Occipito dextra anterior	28	14.74
Occipito dextra posterior	24	12.63
Occipito læva posterior	7	3.16
Brow presentations	3	1.68
Face presentations	5	2.63
Breech presentations	29	15.26
Oblique presentations	21	11.05
Unclassified	9	4.74
Twin pregnancies	10	

Ninety-three children presented by the vertex, with the occiput anterior, while 30 occiputs were found posterior. Of the latter, 12 rotated directly posterior, and were delivered in that position. In 18 cases, the occiput rotated under the os pubis.

The series shows 29 breech presentations and 65 extractions by the breech. Twenty-nine of these 65 pelves were deformed, showing the great value of accurate knowledge of measurements of the head and pelvis before extraction is attempted. Early rupture of the membranes, which occurred in 21 breech cases, is to be prevented by every possible means. For this purpose, the use of Karl Braun's colpeurynter, and an elevated position of the pelves, are useful. Complete dilation of the cervix and perineum, and the application of pressure through the abdominal wall during extraction, are necessary adjuncts in the successful treatment of breech labors.

Of 21 oblique presentations, the fetal heart was irregular in 4, and could not be heard in 7 cases prior to the version. In 10 cases, the heart tones were heard normally, but the child was lost from other causes. Ten cases were complicated by deformed pelves. The presence of oblique presentations should suggest the likelihood of pelvic deformity, premature rupture of the membranes, and prolapse of the cord. It is a good rule, in these cases, not to allow the uterus to retract firmly about the fetal body in a transverse position. Either the breech or head should present. A cephalic version, performed in the first stage, when the membranes rupture, may be moderately easy, and this will avoid a more difficult version later on. The injection of saline solution to replace the amniotic water, if retained, by a perforated metreurynter, will serve to maintain

mobility of the fetus until the conditions for extraction are present.

Of the 8 face and brow labors, only one was spontaneous. The pelvis was deformed in 5 cases. Version was done 3 times. Threatened rupture of the uterus complicated 3 cases. One mother, whose uterus ruptured in labor, died later after a Porro.

Cord Around the Neck. The cord was found around the neck in 14 cases (7.3 per cent), the greatest number of coils being 3. Coiling of the cord around the neck or body is serious only when associated with relative shortness. Premature detachment of the placenta and rupture will result in the child's death, unless it is rapidly delivered.

Prolapse of the Cord. Twenty children died from pressure of a prolapsed cord. Many of them were lost in the extraction through a deformed pelvis, as only 8 mothers had normal passages. Ten pelves were generally contracted, 3 being also flat. The fetus presented once by the breech, 4 times by shoulder, and 15 times by the head. Early diagnosis is important in treating this complication. The etiological factors should be kept in mind, and frequent auscultation of the heart tones made in all cases where the presenting part does not accurately fit the inlet.

Dry Labor. The early escape of the amniotic fluid is a serious loss to the fetus. Not only is the progress of the first stage interfered with, but the fetus suffers from direct uterine pressure. The localized pressure of the cervix on the head may induce congestion, edema, and even hemorrhage of the brain. The violent contractions that are common in this condition are harmful alike to both mother and child. There were 14 cases of dry labor in this series, in which the uterine pressure was too great for the child to withstand. If it is possible to insert a metreurynter between the cervix and the presenting part of the fetus, saline solution may be injected into the uterine cavity when its walls are relaxed, under chloroform, if necessary, and retained by means of the bag. By this method, it may be possible to avoid the dangers of a dry birth.

Premature Detachment of Placenta. Premature detachment occurred 10 times. In 7 cases, the second twin was born dead, and the placenta expelled immediately. According to Spiegelburg, in 80 per cent of twins, the second child follows the first within 1 hour, and if the second delivery is delayed, the membranes should be ruptured and uterine massage applied. If the child is in danger of asphyxia, podalic version should be done at once. Of the 3 single births, the deliveries were spontaneous, and the mothers suffered no ill effects from the accident.

The placenta was inserted in the lower uterine segment in 6 cases. In 1 the metreurynter had forced the head through the uterine wall, and both mother and child died. In another, the patient, a young girl, was allowed to become exsanguinated before her condition was discovered, and she died 1 hour after delivery had been effected by craniotomy. Asphyxia in these cases is frequently caused by the acute anemia of the mother, and the watchword should be to save every drop of blood.

Rupture in the uterus occured 5 times, and in each case both mother and child perished. Two cases were neglected, and came under observation late in labor. These 5 deaths, added to that from placenta prævia, constitute the maternal mortality of the series.

TABLE OF DELIVERIES.

Spontaneous	53	Version, negative	12
Extraction	50	Craniotomy	33
Low forceps	23	Cæsarian section	1
Forceps on after-coming head	3	Porro operation	1
Forceps, negative	6	Accouchement forcé	18
High forceps	6	Manual dilatation	13
High forceps, negative	13	Metreurynter	1
Version	34	Cervical incisions	1
Braxton-Hicks version	6	Evisceration	2
		Decapitation	2

In order to avoid as far as possible the death of the child in labor, it is necessary that the attendant should be familiar with the numerous conditions present at the onset of labor that may jeopardize its safety. These include the presence of pelvic deformity, the presentation and position of the fetus, the presence of twins, hydramnion, placenta prævia, eclampsia, and the physical condition of the patient. Many of these evils can be eliminated if the patient will put herself under medical care early in the pregnancy, and this fact is being more appreciated by the laity. By reason of a

careful ante partum examination, the attendant is made cognizant of the abnormal conditions present, and if they cannot be remedied, he will be prepared for the various complications that are apt to follow.

The early detection of threatened asphyxia in labor is only possible when frequent auscultation of the fetal heart is made. The disturbance of the heart is the best evidence we have of danger to fetal life. Although the increased activity of the fetal motions is claimed to be a valued sign, cases are common where excessive movements are followed by the delivery of living children. Unless a record of the fetal motions has been kept for some time, and careful observations taken during labor, which is seldom done, this sign of threatened asphyxia is of little value, if not corroborated by other evidence. No one would use the forceps or perform a version because of excessive fetal motions alone. Absence of heart tones is no proof of the child's death, unless corroborated by other evidence

As shown by v. Hueter, slowing of the fetal heart during pains is normal, and the normal rate is only found in the interval. To indicate danger, the heart should be slowed progressively between the pains. This slowing is due to brain pressure, or to irritation of the medulla through the excess of venous blood. Later the heart tones are increased in rapidity when paralysis of the heart occurs, as shown by Schultze, and an immediate delivery is necessary to save the child. If the heart rate falls below 100 beats per minute, or rises above 160, during the intervals between uterine contractions, the child is in danger of asphyxia. Irregularity of the heart tones, or weakening, and a more valvular effect of the first sound, should put the attendant on his guard.

The passage of meconium through the sphincter ani is due to the active peristalsis of the intestines forcing the meconium out of the body. Williams claims that the phenomenon is due to paralysis of the sphincter caused by the faulty æration of the blood, but asphyxia in the living child causes spasms and contractions of the muscles rather than paralysis, except late in the process, and if the sphincter is paralyzed at that time, there would in all probability be a paralysis of the intestines as well, and meconium would not be discharged as a result. Evidence of former attacks of partial asphyxia, as shown by greenish meconium thoroughly mixed with liquor amnii, is not incompatible with the birth of healthy and normal children. Only when fresh black meconium is forced out of the uterine cavity in head or shoulder presentations are we justified in extracting.

A very certain sign of asphyxia, though rarely elicited, are the movements made by the fetus in efforts at respiration. If the head presents, the examining finger may detect a motion similar to that which accompanies the act of swallowing. The head is quickly extended and flexed. The same motion is seen in a foot in breech presentations. If air has entered the uterine cavity, it may be inspired by the fetus, and the so-called vagitus uterinus, or intra-uterine, cry be heard. It may also be possible to pass the hand above the head and feel the fetal chest expanding in utero. Palpation of the cord gives us absolute information as to whether the fetus lives or not, and aids in determining what method of extraction is best suited to the case in hand. While we are in duty bound to follow that method of treatment that gives the child the best chance for its life, it is unwise to perform a serious and difficult operation in the hope of saving a deeply asphyxiated child, at the risk of injuring and lacerating the tissues of the mother. Watchful expectancy and careful diagnosis will early decide the treatment to be instituted, and operative procedures can be carried out, when both mother and child are in good condition. Forewarned of the probable complications of labor by a careful ante partum examination, frequent auscultation of the fetal heart sounds will enable the attendant to save many children that would otherwise be lost.

BIBLIOGRAPHY

Stewart. Intracranial hemorrhage. N. Y. Med. Jour., 1903. p. 63.

Freer. Fetal mortality in induced labor. British Med. Jour., 1903, p. 244.

Atkinson. Live birth and still birth. St. Barth. Hosp. Jour., 1903, p. 156.

De Lee. Asphyxia neonatorum. Medicine, 1897.

Jacobi. Results of asphyxia immediately after birth. Arch. Ped., 1890, p. 070.

LONG. Physiology of lungs and heart as related to asphyxia. Internat. Med. Mag., 1892, p. 1,136.
ORD. Prevention of asphyxia in head last cases. London Lancet, 1901, p. 1,449.
SHRADY. Etiology of still births. Bost. Med. & Surg. Jour., 1885, p. 322.
SCHULTZE. Handbuch der Kinderkranheiten, 1877, s. 15.
BROTHERS. Still births. Amer. Jour. Obstet., 1896, p. 756.
MORSE. Cerebral injuries at birth. Amer. Jour. Obstet., vol. 43.
WALLICH. Recherches d'anatomie pathologique chez le nouveau-ne. Ann. de Gyn. Tom. il, p. 201.
HENRICIUS. Erster Athemzug. Zeit. f. Biologie., bd. 26, s. 176.
HENRICIUS. Tod im Geburt. Zent. f. Gynäk., 1883.
KRISTELLER. Athemzug vor dem Geburt. Monats. f. Geburtsk., 1865, s. 321.
BAISCH. Reformen in der Therapie des engen Becken. Leipsig, 1897.
LAHS. Cause of first breath. Archiv. f. Gynäk., 1873, s. 311.
SCHWARTZ. Pressure on head and friction of fetus. Archiv. f. Gynäk., bd. i, s. 361.
COHNSTEIN AND ZUNTZ. Der ersten Athemzug. Pflueger's Archiv., bd. 14, s. 605.
FLATAU. Vagitus uterinus, Zent. f. Gynäk., 1896.
WILSON. Intracranial hemorrhage of the new born. Phila. Med. Jour., 1901.
HECKER. Verhandlungen der Gesellschaft von Geburtskunde, Berlin, 1853.
WEBER. Beitrage zur pathologischen Anatomie der Neugebornen. Kiel, 1851-1854.
DOGHERTY. Dublin Journal, vol. 2xv.
SEIFERT. Asphyxia. Zent. f. Gnyäk., bd. xx, h. 5.
HAAKE. Herumschlingen der Nabelschnur. Zeit. f. Med. Chir. u. Geburt., 1865.
POPPEL. Still birth statistics. Monatschr. f. Geburtsk., 1865.
LITTLE. Influence of asphyxia on the future condition of the child. Trans. London Obstet. Society, vol. iii, p. 293.
SPENCER. Visceral hemorrhages in still born children. Trans. London Obstet. Society, vol., xxxiii, p. 203.
BROTHERS. Infantile mortality during childbirth, 1896.
SCHULTZE. Tod des Kindes wahrend der Geburt. v. Winckel's Handbuch der Geburtschülfe, bd. ii, theil. 3, s. 1683.
AHLFELD. Die Geburten alterer Erstegschwangerter. Archiv. f. Gynäk., 1872, s. 510.
BIDDER. Ueber alte Erstebarende. Diss. Dorpat., 1894.
FEHLING. Ueber die Compression des Schadels bei der Geburt., Archiv. f. Gynäk., 1874.
DOHRN. Ueber die Einfluss der Operationsfrequenz auf die Todgeburten. Archiv. f. Gynak., 1872.
HAMMER. Beitrage zur Pathologie des Neugebornen. Zeit. f. Geb. u. Gyn., bd. 50, 1893.
LENHOSSEK. Das Problem der geschlechtsbestimmenden Ursachen, 1903.

FALLACIES OF INTRAABDOMINAL AND ATMOSPHERIC PRESSURE AS SUPPORTS OF THE UTERUS AND ABDOMINAL ORGANS[1]

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IN considering the question of intra-abdominal and atmospheric pressure, which has been the subject of numerous and varied opinions, I am compelled to ask the indulgence of at least two classes. First, those who will so readily agree with me that they will consider the arguments and proofs unnecessary, and, second, those who will disagree with with me to the extent that these same arguments will be unavailing. In the hope, however, that there is a middle class who may have been misled by the current literature, but who will accept the laws of physics as having relation to the contents of the abdomen as well as to other material things, I have thought desirable to present this paper.

In order that we may understand, to some extent, the prevalence of error which exists in medical literature, I will first present the following extracts from text-books and periodicals:

HART AND BARBOUR, 6th ed., p. 373.

"We may thus suppose that intra-abdominal pressure (which, when the uterus is in its normal position, is directed upon its posterior surface) comes now to act upon its anterior surface and drives the fundus backward and downward." On pages 61, 75, and 385 this author speaks of intra-abdominal pressure as a downward force.

[1] Read before the Chicago Gynecological Society January 12, 1903.

MONTGOMERY, 2d ed., p. 423.

"The round ligaments are, of course, an insignificant force, but it must be remembered that the uterus weighs less than an ounce, and we can understand, therefore, how they serve to maintain the uterus far enough forward to permit the intra-abdominal pressure to be directed against its posterior surface. So long as the intra-abdominal pressure continues upon the posterior surface of the uterus it is held forward against the bladder."

HIRST, Disease of Women, 2d ed., p. 286.

"In the erect posture, the bladder affords the uterus considerable support in a moderately distended condition, and intra-abdominal pressure with the weight of the abdominal contents upon the posterior uterine wall is a most important factor in maintaining a normal position of the uterus." Page 288, Hirst further says: "If she (the patient) is allowed to strain too hard in defecation; to lift her baby, or make any physical effort in the early puerperium, that much increases *intra-abdominal pressure*. the uterus is likely to turn over backward."

GILLIAM, pp. 174, 175.

"The uterus being retroverted, the *intra-abdominal pressure* falls on the fundus and anterior surface of the same, forcing it downward." Again, p. 189, "The bulging forward of the posterior wall in rectocele drags the cervix forward and downward, and tilts the uterus backward until *intra-abdominal pressure* is exerted on its anterior surface." He again says, on pp. 188 and 189: "In the newly delivered woman the abdominal walls are flabby, thus, in great measure, abolishing the *retentive power* of the abdomen."

On p. 174: "Intra-Abdominal Pressure." "This is a factor for good or evil, according to the position of the uterus. Where the fundus is directed forward so that the intestines rest upon the posterior aspect of the uterus, the intra-abdominal pressure serves to maintain it in a state of anteversion, and to prevent retroversion. It also counteracts the ascent of the uterus, and by holding it forward out of line of the vaginal canal, prevents its descent. If, however, the uterus is in a state of retroversion, so that the intestines fall upon the fundus, and anterior aspect of the same, the intra-abdominal pressure serves to aggravate the condition by forcing it still farther backward and downward along the vaginal canal."

RETENTION OR SUCTION POWER OF THE ABDOMEN

"This is due," says Gilliam, "to the counteracting influence of the atmospheric pressure from the outside, which opposes descent of the pelvic organs through the natural pelvic outlet. A very familiar illustration of this physical fact is found in tapping a barrel which is filled with liquid. Daily experience teaches us that if only one opening is made in the barrel, the contents will not flow. This is because of the almospheric pressure from without. If now an air hole be made above the level of the fluid so as to admit air into the chamber, this counterbalances the atmospheric pressure at the opening or exit, and the contents escape by their own weight. If one end of a glass tube be placed in a vessel of water, and the other in the mouth, and the air is exhausted, the atmospheric pressure causes the water to rise in the tube and fill the mouth. The retentive power of the abdomen is a constant and important factor in preventing the prolapse of the pelvic and abdominal organs, though not so effective as it might be were the abdominal walls rigid and unyielding to ward off lateral pressure."

DUNCAN MATHEWS

Retentive power of the Abdomen.— Edinburgh, Med. Jour., 1865, Vol. XI, p. 516, speaks of retentive power as a mechanical quality. The uterus ascends during pregnancy as a result of the sucking of "the retentive power." He says, "Another illustration of the physiological use of this retentive power, is, I believe, to be found in the study of what is called the ascent of the pregnant uterus from the pelvic cavity into the abdominal cavity. As the uterus enlarges in early pregnancy (sometimes, also, as it enlarges in disease) the base of the thorax of the female is expanded, the capacity of the abdominal cavity is increased and the uterus, instead of forcing its way against the influence of gravitation, is probably drawn up, at least, to some extent into its new site. In some cases, as I shall hereafter mention, this drawing up is abnormal or extraordinary in force, and the uterus is then entirely sustained by the drawing up forces, being removed from solid subjacent support." He then proceeds to explain retention of the urine, the support of the liver and other abdominal organs as being due to the retentive power of the abdomen, and considers this as something apart from atmospheric pressure. He also uses this theory to explain the absence of hæmorrhages after delivery. He accounts for the ascent of the semen, the backflow of blood and pus, and the abnormal wanderings of the ovum in this way. "Hæmorrhoids and varicose veins," he says, "are due to lack of retentive power."

PENROSE, Text-book of Diseases of Women, 5th ed., p. 99.

"Finally, this motion (downward motion) is restrained by what has been called the 'retentive power of the abdomen,' which is merely atmospheric pressure acting from below on the contents of a vessel, the top and sides of which are closed. If a glass tube be filled with water a finger placed over one end, and the tube inverted, the water will not run out; it is sustained by atmospheric pressure from below. In order that the column of water be sustained, the sides of the tube must be rigid and unyielding. If the sides of the tube yielded slightly to atmospheric pressure, they would sink in and a certain amount of water would escape."

"The abdominal and pelvic cavities in the erect woman may be considered as a tube, filled with fluid contents. The top of the tube is closed by the diaphragm; the sides are the more or less rigid abdominal walls and the back, the floor is the perineum.

When the floor is destroyed, a hole is made in the bottom of the tube; the contents tend to fall, but the fall is resisted by atmospheric pressure acting from below." Penrose then goes on to show that the retentive power due to atmospheric pressure is proportionate to the rigidity of the abdominal walls. "When a woman is erect, the uterus lies at a slightly lower level than when the woman is on her back, and the intra-abdominal pressure, acting upon the posterior surface of the fundus, turns the uterus more forward, so that the fundus lies nearer the symphysis pubis."

Sielski, of Lemberg, has written an article upon the mechanics of uterine support that is remarkable for its contradictions and erroneous statements. Space will not permit quotations in full, and I can make only brief mention of the most striking. He considers high fixation of the uterus a cause of increased cervical discharge through lessened pressure in the vagina. He also attributes sterility to this cause at times — the spermatozoa not being able to pass from the lesser pressure of the vagina to the greater pressure of the uterus and tube. He considers the uterus superimposed upon the bladder and held by adhesion and air pressure. Two peritoneal surfaces, he teaches, cannot leave each other, in a perpendicular direction, without great force; that they can only slide upon each other. He considers the liver held against the diaphragm by atmospheric pressure, laying no value upon the ligaments. One intestine loop cannot leave another or the abdominal wall, nor the uterus the bladder, because they are held by atmospheric pressure, and yet he considers that these organs are not held together by atmospheric pressure as soon as the abdomen is opened. Perhaps he overlooks the fact that the liver continues to move with the diaphragm, even when the abdomen is opened. Even these remarks do not convey a half of the absurd things that he expects the "sucking" and "atmospheric" pressure and "lessened resistance" to do. I do not wish to have it understood that these men are alone in believing what these quotations and abstracts show, nor do I hold that these are all of their misleading remarks. I wish to say, also, that in the writings of some of these authors were other things which showed them to have reasoned more logically. I have merely undertaken in the above to show that these beliefs pervade the literature, and require attention:

The erroneous teachings are:

1. That intra-abdominal pressure is downward only, pressing upon the posterior aspect of the uterus, drawing it forward when the uterus is forward of a vertical line, and upon the anterior aspect of the uterus, drawing the organ backward when it is posterior to a vertical line.

2. That the abdominal organs are buoyed up by some unknown force called the "retentive power of the abdomen."

3. That the abdominal organs are held by atmospheric pressure upon the abdominal walls, this being due to their pliability.

4. That the abdominal organs are held by atmospheric pressure from below, this being possible by reason of rigid abdominal walls.

5. That water will not flow from a tube if one end be covered. (Penrose.)

6. That liquids will not flow from a barrel with only one bung hole. (Gilliam.)

7. That the uterus travels upward during pregnancy because of "suction." (Duncan.)

8. That abdominal and pelvic organs are not held in position by ligaments.

9. That abdominal organs are held in contact and cannot be separated in a perpendicular direction without great force.

In order to make plain the error in the above beliefs, let us first consider with what structures we are dealing. The abdomen may be considered a large, closed cavity, filled entirely with contents, and a wall partially fixed, and partially contractile and elastic. The walls, as far as they are of use to the abdomen itself, may be considered protective, restrictive, supportive and expulsive. Their strength lies, under normal conditions, so as to be of greatest use for these purposes. The upper wall is thin, because it does not have to resist gravity of organs. The pelvic floor is strong, because of this extra work. That Nature has provided for this is seen in the much stronger pelvic floor in upright animals, while quadrupeds have a much stronger fascia lata over the abdomen.

The contents of the abdomen are semi-solid structures, and hollow viscera containing gases, liquids, and semi-solid materials. The viscera are partially, or almost completely, covered with peritoneum, and this, instead of

enclosing each organ separately, is continuous, making a closed sack, containing a small or large amount of fluid. From the standpoint of support, the peritoneum is interesting, not in that it is a closed sack, but in that it runs from each viscera to a more fixed structure, and in this fold encloses connective tissue, and, in some instances, muscular tissue, which, together with the peritoneum, makes a suspensory ligament. This is, also, a neuro-vascular pedicle. The fluid in the peritoneal cavity, the hollow viscera with well lubricated coverings, which allow one to move easily upon the other, the gases and liquids in the viscera, give to the abdominal contents somewhat the nature of fluids, being governed by some of the laws which govern fluids. Physicists recognize, however, thin fluids, and viscid fluids. In the latter, the laws are not obeyed so promptly; but given time may, if not too viscid, act just as surely. By many, the abdominal contents are likened to a fluid, but, because of the semi-solid nature of some of its structures, it must be considered of a viscid, liquid nature. In ascites the laws of fluids would be more promptly obeyed. With impaction of feces the sigmoid may act only in the line of gravity. For practical purposes, then, we may consider the abdomen as a large, contractile sack, filled with a viscid fluid, but failing to exert all the gravity of the fluids upon upon the sack because much of the weight is carried by the ligaments of the different viscera. Now, to analyze the forces which are found making pressure in an elastic sack, we have to consider the elasticity of the sack, the weight of the contents, and the kind of contents.

1. We have the pressure upon all structures by reason of the contents being too large for the sac, or the sac contracting upon its contents. This could be illustrated by overfilling a rubber sac with air. This exerts a force in every direction alike. This in the abdomen changes from moment to moment by contraction and relaxation of the abdominal walls, as in lifting, coughing, sneezing, breathing, etc. From hour to hour, by the formation of gases, food, and water ingested, and urine and feces excreted, from day to day; by relaxation of the abdominal muscles by ascites, growing organs, etc., this force upon gases or thin liquids, would be promptly equal in all directions, but upon viscid contents might be at first imperfectly distributed, but, if continuing to act, would eventually be equal in all directions. This, by some, is called intra-abdominal pressure. This force, acting alone, does not change the position of an organ unless a place of lesser resistance is found. This might make the abdominal contents project through an opening, or make an opening, but it does not work only upon the upper surface of an organ, as implied in the former quotations. This force, acting alone, would as easily cause a hernia through the upper wall of the abdomen as through the lower, if both walls were equal.

2. In a sac or pail we have a force exerted by reason of the weight of the contents. If the contents are liquid, at any height of column the pressure is equal in all directions at any given point, but increases from above downward, so that at the bottom of the pail or sac the pressure is greatest. This force, acting alone, tends to cause the sac to become pear-shaped; tends to find the weak places in the lower part of the abdomen, but not in the upper.

This force would not tend to drive an organ downward. In fact, if the organ lay against, but not attached to, the floor, with the sac empty, upon the introduction of fluid the organ would exert as much less gravity against the floor as the weight of water displaced by the organ. This, then, does not act upon the upper aspect of organs driving them downward. It tends rather to make intra-abdominal organs rise. This tends, then, to put organs at ease and transmit the force to the abdominal wall. If the abdominal wall, say the pelvic floor, is weak, and bulges, it will drag down with it any attached organs, such as the bladder, rectum, uterus, etc. This force acting in all directions at a given point, together with the first named force, is sometimes measured as intra-abdominal pressure.

This combined pressure varies as number one varies, and as the height of the column varies, and would be greater in the lower part of the abdomen. With no free fluid in the peritoneal cavity, and the ligaments in good condition, the difference between this pres-

sure in the upper and lower abdomen is very much lessened.

3. We have, by reason of the solid or semi-solid nature of the abdominal organs, straight downward pressure when they are in equilibrium. This force, acting alone, with structures in equilibrium, would exert force only on the bottom of a vessel and not upon the sides or top. This force, acting alone, causes any organ to drag down, by reason of its own weight, as far as its ligaments would allow it to. Solid structures coming down upon the uterus would act in a vertical line, and force it toward the pelvic floor. Each organ has its own suspensory apparatus to resist this downward movement, but, this failing, the force is transmitted to the structures below, and their ligaments failing, to the bottom of the receptacle.

We have, then, the abdominal organs pressing and being pressed in every direction, to a variable extent by reason of their being too large for the sac or by reason of the sac contracting upon them, and we have them pressing downward, according to the laws governing liquids, each structure being buoyed up by surrounding structures, the pressure becoming greater toward the pelvic floor, this force being transmitted at last to the lower wall, and lastly we have the direct downward pressure of solid structures. Much of the fluids are in the viscera, so we have not only the gravity of the solids, but the gravity of the liquids, resisted by the ligaments of these organs. Intra-abdominal pressure makes equal pressure on all sides of the uterus, as well as all other organs. The fluid pressure exerts an upward pressure upon the uterus, and all other organs, equal to the weight of the fluid displaced. Pressure of solid structures is directly downward when they are in a state of equilibrium. That force which carries the fundus forward when it is anterior to a vertical line, and backward when it is posterior to this line, is gravity. Any of these forces tend, with a weakened, bulging pelvic floor, to cause downward and backward displacement, whether the uterus is anterior to the vertical line or not, for the reason that the bulging perineum makes traction upon the cervix through the medium of the vagina.

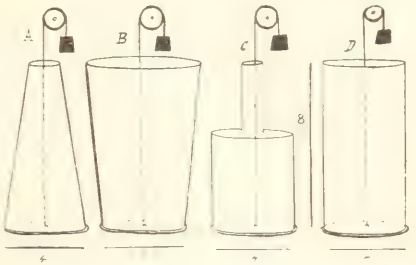

Fig. 1. A, B, C and D. Each same height and same size loose bottom, each requiring same weight to keep bottom in place when filled with water.

The body is adjusted to atmospheric pressure, which is alike on all parts of the abdomen, and no account has to be taken of it when considering the forces which support the abdominal contents. Measurement of pressure in the abdomen indicates merely the pressure above or below atmospheric pressure. Atmospheric pressure can no more be counted upon to maintain abdominal organs, than it can to support the contents of a stove, or to sustain a house. Atmospheric pressure would only press the abdominal wall inward when the pressure within is less than without at the point where it presses, and in that case no support is needed. The abdominal and chest muscles manipulate air for breathing purposes, but air does not manipulate these muscles or the abdominal organs. These statements may be considered opinions, and not proofs. They certainly differ from those held by Penrose, Gilliam, Sielski, Duncan, and others. Some observations, experiments, and illustrations may be used to demonstrate the error of these authors.

Observation number one contradicts Gilliam's statement that liquid will not flow from a barrel with a hole in the lower end only. This observation was made when quite a small boy. A younger brother turned the faucet in a molasses barrel and the contents were found upon the cellar floor. If there is one thing upon which temperance people and topers agree, it is that every whiskey barrel should have an opening in the lower end; but their purposes would differ.

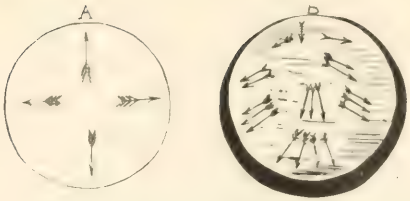

Fig. 2. A. Diagram illustrating pressure in all directions when a sac is filled with air. B. Diagram illustrating increasing pressure upon the vessel walls when filled with water.

Observation number two is, that a jug and bottle lose their contents if inverted. These things seem too simple to record, and yet we are dealing with quotations to the effect that atmospheric pressure will prevent fluid from escaping.

Experiment number one contradicts Penrose's statement that if a tube is filled with water and a finger held over the upper end, the water will not run out. A one-half inch tube was selected, filled with water, the upper end covered with the finger, the lower finger was removed, and the water promptly escaped. Observation number three has noted this many times in a test tube, but a positive statement is made by Penrose. One would say that he refers to a tube so small that capillary attraction would prevent air entering, but in that case, he must not liken the abdomen to a capillary tube. Even though these statements were true, they would still be useless as illustrations, because they, with rigid walls, have no parallel in the abdomen with its elastic walls.

Experiment number two contradicts Sielski's statements that an intestine cannot leave the abdominal wall; that the uterus cannot leave the bladder; that one organ cannot leave another, without great force. A rubber glove has its fingers tied, with air and water in them; the glove is then turned over the fingers, filled with other glove fingers, containing air and water, and the glove containing some water is tied at the wrist. This gives us a sac like the peritoneal sac, with rubber surfaces instead of peritoneum in contact. This is not so well lubricated as the peritoneum, and, therefore, its surfaces adhere more, but the walls are easily made to leave any portion of the contents. One portion of the contents leaves another portion with the greatest ease.

Experiment number three proves the same. The intestines of a rabbit are placed in a rubber, air-tight sac, and it is found that they can be made to leave each other and the abdominal wall in a perpendicular direction.

Experiment number four indicates the same on a rabbit. The abdominal walls were cut away down to the peritoneum, and it was found that the peritoneum could be picked up without the bowel or omentum, the two walls easily falling together. By manipulation, one bowel could be moved from the other without force.

I could find no reliable experiment to disprove Duncan's statement that the uterus ascends during pregnancy, because the abdomen first enlarges, leaving a negative pressure in the upper part of the abdomen which sucks the uterus up; but my judgment is strongly against this. My opinion is that the growing uterus is the cause of abdominal enlargement, and that intra-abdominal pressure is increased during pregnancy. Neither can I subscribe to his belief that the retentive power of the abdomen is the power by which the semen ascends, and hæmorrhages are prevented, but rather am I inclined to believe that a lax abdominal wall, with negative pressure, would favor a tardy contraction of the uterus, and so favor hæmorrhage.

Some experiments show what should, according to the laws of physics, occur with a

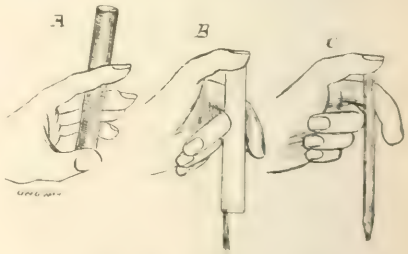

Fig. 3. A tube filled with water. B. Same inverted; water running out. C. Capillary tube in which water is retained as long as upper end is covered so as not to admit air.

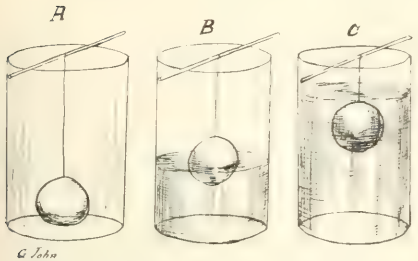

Fig. 4. A. Empty jar containing a body heavier than water, and fastened to a crossbar by means of a rubber. B. Same partly filled with water. C. Same filled with water until rubber and water no longer carries the body above the surface.

structure like the uterus, suspended in the lower part of a receptacle. In this connection, let us remember that the uterus, while a pelvic organ, is an abdomino-pelvic organ; that it is above the pelvic floor, and not a part of the pelvic floor. It is attached to the pelvic floor by means of the vagina, but this is not intended to act as a ligament to hold the pelvic floor up, nor the uterus down, and, being below the uterus, and not a column, it cannot be intended for uterine support. With lax uterine ligaments, the uterus may come to lie against the pelvic floor. This is true of the kidney, sigmoid, stomach, or liver.

Experiment number five: A body heavier than water is suspended by means of an elastic ligament so that it just touches the bottom of a glass jar. Water is now added, when the body begins to rise, and continues to do so, until the combined buoyancy of the water and lift of the now contracted ligament are not sufficient to raise it further. This indicates that the uterus, which is suspended by its ligament at a certain height in an empty abdomen, would be carried a little higher if the abdomen contained contents of the nature of fluid.

Experiment number six: A body is suspended in a glass jar and attached to an elastic bottom. Water is added, with the jar still resting upon a solid base so that the water cannot depress the bottom, and the body rises, but less than it would without the attachment to the bottom. The jar is now lifted from its support, allowing the weight of the water to depress the elastic bottom when the elastic attachment causes the suspended body to become depressed. If this is at one end, the long axis of the body approaches more nearly the vertical line. This means that if the pelvic floor is weak, and sags, it drags by means of the vagina upon the uterus, and being attached to the posterior end of the uterus, throws it into a more nearly vertical position, and stretches the sacrouterine ligament. This would not occur with a strong pelvic floor.

Again, we may suppose the uterus suspended the same way, while solids are placed in the jar; the uterus is now carried down by two forces — the sagging pelvic floor pulling upon it, and the solid structures making pressure from above.

Mayer scouts the idea of "negative pressure," even in the knee-chest position, and speaks of intra-abdominal pressure as a "chimerical phantom." His arguments lack logic and proofs, which are characteristic of Hörmann's article.

Experiment number seven: This disproves Mayer's statement and explains the phenomenon observed in the knee-chest position. A glass jar, open at both ends, is covered at one end with a thin rubber dam. The jar is now filled with water, which causes the rubber dam to sink down markedly. While this sinking is prevented to its fullest extent, two thicknesses of rubber dam are tied over the upper end. The water is now allowed to bulge the single

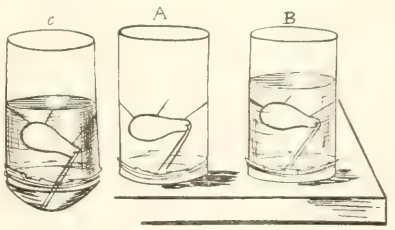

Fig. 5. Diagram illustrating uterus suspended in vessel with elastic ligaments and attached to an elastic bottom. A. Vessel is empty and sitting on a solid base preventing bottom from being depressed. B. Same filled with water causing the uterus to ascend, but being attached at vaginal end this is held somewhat. C. Same vessel removed from solid base. The weight of the water depresses the bottom and drags the uterus with it. This illustrates the effect upon the uterus of a weak pelvic floor. (See text.)

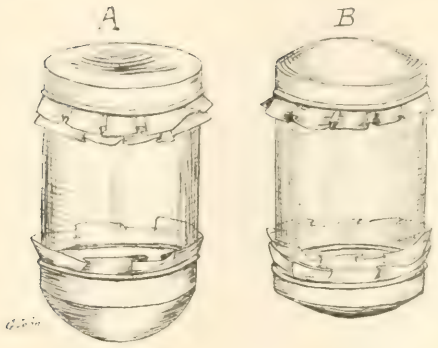

Fig. 6. Represents a jar with rubbers over each end, one end having one layer, the other two layers making it stronger. A. Represents the weak end downward with much bulging thereby causing negative pressure above. B. shows the two layers at the bottom with less bulging or positive pressure above. (See text).

layer, which causes the double layer to be drawn into the jar. The jar is now inverted, and both ends bulge. In other words, if the two layers furnish the floor, the water is not allowed to sink so but that the roof bulges. If now the jar be again inverted, and the two layers are above, they will be drawn in as before. If now an opening be made through these two layers, air will rush in, and the double rubber will return to position. If an opening had been made in the single rubber while above, water would have flowed outward. The two rubbers here represent the pelvic floor and solid pelvic walls, while the single rubber represents the more elastic diaphragm and upper abdominal walls. With the patient upright, we may have positive pressure in both parts of the abdomen, but with the patient in the knee-chest position, the abdominal contents find space in the more roomy diaphragmatic region, and the pelvis is left with a negative pressure and air rushes in upon opening the anus, vulva, or urethra.

Numerous efforts have been made to measure the pressure in the abdomen, but very variable results have been obtained. L. Bert and Hogge made measurements in the rectum. Kronecker, Meltzer, Rosenthal, tried measurements in the stomach, while Schatz calls attention to error in estimating intra-abdominal pressure from measurements made in the bladder. Luciani introduced a small rubber bag into the abdomen and connected it with a manometer; Hörmann criticises the work of these men, in that they considered abdominal pressure uniform, as they took it in only one place and gave measurements for the whole abdomen. They also made the mistake of considering intra-abdominal and intra-visceral pressure identical. Schatz lays stress upon the existence of uniform pressure throughout the abdomen, and considers it independent of gravity or muscle pressure. Dubois distinguishes between intra-abdominal and intra-intestinal pressure. Weisker, in measuring pressure in his own stomach, found the pressure to vary with changes in position. Moritz, after having himself tied to a ladder, found stomach pressure 7-8 cm. while in the dorsal position. Then, standing on the head, the column rose slowly to 20 cm., but returned to 6.5 cm. when he was let down to the dorsal position; in right side

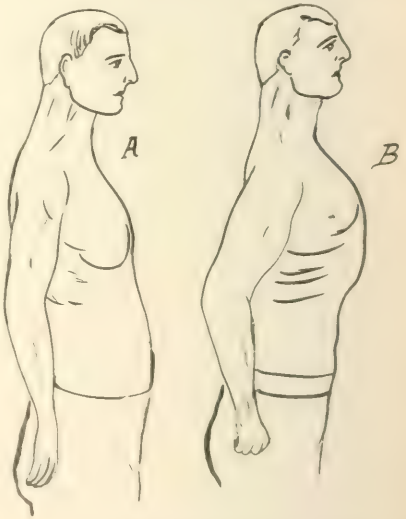

Fig. 7. A. Abdominal muscles relaxed with diaphragm low. B. Abdominal muscles contracted forcing diaphragm up. Abdominal walls not forced in by atmospheric pressure by muscular effort.

position 10 cm., in left side position, 42 cm. Qurin made measurements upon animals under complete anæsthesia, and found, with the animal on the back, 10 mm. (mercury) during inspiration and 5 mm. during expiration. Hanging tied to a board with belly down, he found during inspiration 60 mm., during expiration, 52 mm.

Hörmann found in living man negative pressure in rectum in knee-elbow position 14 and in dorsogluteal position 17 cm. He found negative pressure of 9 cm. in bladder with patient in the Trendelenburg position.

In dogs under deep anæsthesia, or recently killed by chloroform, he found negative pressure in the peritoneal sac in epigastrium in vertical suspension on the shoulders, 7.5cm. Negative pressure in epigastrium in vertical suspension on hind legs, 9 cm. Negative pressure in peritoneal sac close to the spinal column, abdomen hanging free or in lateral position, 2 cm.

In conclusion, I would say:

1. The abdominal contents in an elastic sac are composed of liquid, gaseous, semi-liquid, semi-solid, and solid material of variable quantities.

2. By reason of their being too great for the sac at times, and by reason of muscular action, we have an intra-abdominal pressure which, with equilibrium, would be equal in all directions.

3. By reason of the constant disturbance of equilibrium, and by reason of the sluggishness of the abdominal contents to respond to fluid pressure, this pressure varies in different localities at a given time.

4. This pressure varies in different individuals, and in the same individual, from moment to moment, with sudden muscular contractions; from hour to hour, with ingestion of food and water, and with excretions; from day to day, with changes in abdominal contents.

5. This pressure does not tend to drive organs downward by acting upon their upper surface, but merely finds the places of least resistance in the walls, and endeavors to force contents through these areas.

6. The abdominal contents all have gravity and are sustained by the walls of the sac, the same as the contents of any other sac, except that each of the viscera is suspended by its ligaments.

7. Each organ is primarily suspended by its attachments, but by reason of the semi-fluid nature of the contents, each organ is partially floated by the others and the weight transmitted partially to the abdominal floor.

8. Any organ floating in fluid presses downward as much less upon its supports as the weight of the fluid displaced by the organ (Archimedes' Principle).

9. The pressure of fluid contents is equal in all directions at a given point, but this pressure is finally transmitted to the walls of the sac perpendicular to its surface, and in proportion to the height of the column above the given surface.

10. By reason of these principles, the abdominal contents do not press the uterus down, when they act in the nature of fluids, but rather they buoy it up.

11. Intra-abdominal pressure, which is equal in all directions, and fluid pressure, which buoys the uterus up, indirectly cause the prolapse of the uterus by not finding the proper resistance at the pelvic floor.

12. The pressure of solids is directly downward when in a state of equilibrium, and it is possible to have abdominal contents of a solid nature come down upon the uterus in such a way as to hold it forward when it is anterior to a vertical line, and backward when it is posterior to a vertical line.

13. The gravity of the body of the uterus itself tends to hold it forward when it is anterior, and backward when it is posterior to a vertical line.

14. Intra-abdominal pressure does not have the above effect, but tends, when excessive, by its action on the pelvic floor, to cause displacement, whether the uterus is forward or not.

15. Atmospheric pressure has no part in the support of abdominal organs, more than it has in the support of grain in an air tight sac.

16. Atmospheric pressure acts merely in an effort to make the sac fit the contour of the abdominal contents, which they, by their gravity, and resistance of some portion of the sac, take.

17. Atmospheric pressure presses the wall in where the contents are making no pressure, therefore, where support is not needed, and never where they are making positive pressure, where support is needed.

18. In other words, when lax ligaments allow abdominal organs to make undue strain upon the pelvic floor, bulging the lower part of the abdomen, the air would be pressing inward at the epigastrium and diaphragm.

19. The abdominal organs are not held together surface to surface, so that it is difficult for one to leave another. One moves as easily away from the other, and something else moves in to take its place, as though they were in a sac of mosquito netting.

20. The uterus is an abdominopelvic organ, and not a part of the pelvic floor.

21. It lies normally above the pelvic floor and not against it, but is attached to it by means of the vagina.

22. If the vagina is to be considered a ligament, it must be for support of the pelvic floor or to prevent ascent of the uterus.

23. The uterus may come to lie upon the pelvic floor, but so may the other abdominal organs.

24. The pelvic floor is, then, only indirectly a support to the uterus, as it is to other abdominal organs.

25. With a weak pelvic floor, we may have hernia of abdominal organs; first the bladder and rectum, then the uterus, and then other organs.

26. The uterus is primarily supported by its ligaments, but may be partially carried by fluid pressure or may be pushed downward by solid structures.

27. With a weak pelvic floor the bladder, rectum, uterus, and ligaments may be called upon to do this work of the pelvic floor, and may succeed for a time, but are apt to rebel sooner or later, and prolapse, especially with excessive intra-abdominal pressure.

28. The pelvic floor is a very important structure in abdominal support.

29. Injuries to this structure are often responsible for displacements of the uterus.

30. When displacements have occurred, however, orthopedic work upon the ligaments is usually as necessary as repair of the pelvic floor for permanent relief; neither alone is sufficient.

31. The uterine ligaments, being the normal support of the uterus, should receive our attention when surgical work is necessary, rather than the creation of false ligaments.

32. In increased intra-abdominal pressure, much may be accomplished by remembering that the contents of the abdomen are too great. Diet, exercise, massage, positions, will accomplish much.

III. THE PERIOD OF AWAKENING OF MILITARY SURGERY

By NICHOLAS SENN, M. D.

AS the day is separated from night, by dawn and twilight, so one period of the history of military surgery gradually, almost imperceptibly, shades into another; there are no well-defined landmarks set between them. Some of the lights, kindled during the mediæval age, have become permanent fixtures in the modern medical sky, and will remain there as long as the art of surgery will be practiced. The ligature, introduced by Paré into general practice, rude and defective when first employed, has reached a degree of perfection in modern times which leaves but little if anything to be desired. The teachings of Paré, on the method of exploring bullet wounds with the probe, have never been improved upon, and must be borne in mind at the present time, in the exceptional instances in which a recourse to this diagnostic expedient is deemed necessary. The importance of establishing and maintaining free drainage in the treatment of suppurating wounds, as emphasized by a number of the old masters, has only increased with the advancement of surgery. We will now discuss an ill-defined period in the history of military surgery that marks the gradual transition of the mediæval age into what deserves to be called modern military surgery, and for reasons which will be advanced in this lecture may

well be called the period of awakening. It is a period during which the representative military surgeons cast off the yoke of authority and sought new light by accurate clinical observation, original thought, and to some extent by original research. It is a period which foreshadowed the dawn of modern military surgery. It was during this period, dating back to the latter part of the eighteenth century, that human genius was busily engaged in improving and perfecting the old, clumsy firearms, and we will first discuss the

IMPROVEMENTS OF THE OLD FIREARMS

Up to the beginning of the nineteenth century, all military firearms were smooth-bores, and fired round large balls. The greatest improvement made, up to that time, was the substitution of the percussion cap for the flint-lock, about the year 1820. The metallic ramrod was introduced in Prussia by Fürst von Anhalt, in 1718, an improvement which made loading more expeditious. Hand-grenades were used for a long time. As they had to be lighted with a fuse and had to be thrown by hand, they could be employed only at short range. The short range of the small firearms of that time made it necessary to approach the enemy to within two hundred yards or less, to render the fire effective, and hence, hand-to-hand encounters and cavalry charges often constituted the decisive point of battle. During the middle of the seventeenth century, bombs fired from mortars, and which were exploded by a percussion cap when they hit their mark, took the place of the hand-grenades. The old cannons are noted for their prodigious size, and it always has been a mystery to me how Napoleon I. ever succeeded in hauling the monster cannons to Moscow which, after his defeat, have been sleeping within the walls of the Kremlin. Gradually the muskets and cannons were made smaller as their calibers were reduced. While the rifling principle had been known and used for many years, it was not introduced for military service until the beginning of the nineteenth century; to these rifles was then applied the percussion cap. The breech-loading principle was also made a partial success for military arms at the same time. In Prussia, the army was supplied with the needle-gun in 1841. This invention was eagerly adopted, and in a few years different breech-loaders replaced, in every country, the muzzle-loading rifle. The introduction of the jacketed bullet, which combined the cap, powder, and bullet in one case, marked another important step in the evolution of the military firearms. In the United States the first effective breech-loader was invented by Hall in 1811. In 1854, Congress made an appropriation for breech-loading rifles, and a board of officers recommended those of Sharps and Symmes for trial. Three years later, the Burnside rifle found more favor, but was not recommended for adoption. During the Civil War, the best known breech-loaders were those of Burnside, Sharps, Maynard, and Henry. After the war, the Peabody, Remington, Sharps, and Springfield were received with greatest favor, more especially the Springfield rifle. With the gradual improvements of the small firearms, new inventions of increased destructive power, fired from large arms, were introduced in warfare and inflicted horrible wounds, for the successful treatment of which the military surgeons were not prepared. Of these the shell is the most familiar to the soldier. It is a hollow projectile, containing an exploding charge which at some point of its flight is fired by means of a fuse. Case-shot is used in warfare on account of the greater number of fragments resulting from the separation of its cluster. Case-shot comprise grape-shot, canister, and shrapnel. Canister and grape-shot break up at the muzzle of the gun. Shrapnel, by means of a fuse, are made to burst at any desired distance. From the character of the firearms and projectiles in use during the period of the history of military surgery under discussion, we shall follow the evolution of the treatment of wounds inflicted by large round bullets of slow velocity and low penetrating power.

NEW IDEAS ON THE TREATMENT OF GUNSHOT WOUNDS

A study of the literature on military surgery, from the middle of the eighteenth century to the beginning of the dawn of modern surgery, will convince the reader that, during that time, reason gradually took the place of blind

superstition, and independent thought and a growing spirit of research gradually liberated surgical practice from the slavery and dogmatism of ancient authorities. The mysterious drawing salves and plasters lost their reputation and were replaced by remedies which possessed antiseptic properties, such as turpentine, camphor, and the different kinds of spirits. Turpentine was also extensively used as a styptic. Mr. Young, quoted by Atkins,[1] speaks of the styptic action of this remedy, as follows: "That it restrains a hemorrhage by contracting the orifice and begetting a firm coagulation of the blood; which coagulum, he thinks probable, heals the orifice of the bleeding vessel, either by uniting its coat, per symphisin, or by concarnation, i.e., begetting some intermediate substance, which it will nimbly do." The styptic action of oil of turpentine was recognized by the late Professor Billroth, who recommended it in cases of troublesome hemorrhage after excision of the tonsil. The treatment of hemorrhage, even during this time, was by no means uniform. Wiseman, who is called by Atkins the "Oracle of English Surgery," preferred the cautery to the ligature, claiming that it secures the bleeding arteries in a moment, fortifies the part against future putrefactions, and the stump, after amputation, requires the bandage less strict.

Atkins himself indorses this opinion, on the whole, believing that the cautery is a protection against mortification, but in case of hemorrhage from large arteries, he advises the surgeons to make usé of the ligature. The experienced military surgeon, Theden, never ligated, but used the tampon and compression dressings.

Bilgür, who amputated only in exceptional cases, usually for gangrene, tied the vessels in the healthy tissues above the point of amputation. Water dressings took the place of salves, plasters, and infusions, on the recommendation of the surgeons of Frederick the Great, Bilgür, Schmuker, Theden, and Mursinna. Before this, wounds were filled with charpie, moistened with wine or brandy. If wounds became foul, the red wash (sublimate and lime-water), balsam of Peru, tincture of myrrh, alcohol or turpentine were used. Charpie, made of old linen, for a long time held its place in surgery, as a covering for wounds; and it would be impossible to compute the disasters caused by this material as a source of infection.

During the wars for more than a century, charitable women busied themselves preparing charpie for the armies, unconscious of the harm they were doing in sending infected material to the battle-fields and hospitals for the dressing of wounds. Even as late as the Civil War, tons of charpie were sent to the front by our patriotic women. Tow and jute, formerly in use, were much safer materials, but for a long time, especially in Germany, were displaced entirely by the infected charpie. That suppuration is not necessary as a preliminary step in the healing of wounds was first taught by Bentekoe, Overcamp, and Muralt. The older surgeons were not afraid to search for bullets with probe and finger, often enlarging the wound of entrance to widen the canal, and making counter-openings. The blind bullet tracks were always surrounded by a zone of contused lacerated tissue, which led surgeons, during the last century, to resort to primary *débridement*, a procedure which greatly increased the danger of infection. The probe was in constant use, and only too often the finger was also employed in searching for the bullet, or in attempts at extraction. It is safe to state that more wounds were infected by the surgeon's efforts to find and remove the bullet than by the injury they were called upon to treat. Pirogoff was the first one to raise his voice against digital exploration of gunshot wounds; and Stromeyer wanted to exclude the probe from the instrumentarium of the young military surgeons. The ancient military surgeons feared the entrance of air into wounds, and this fear was showed by Lord Lister during his epoch-making researches on the prevention of wound infection. Experience, and later bacteriologic investigations, have shown, however, that wound infection is due largely to contact with the wound of substances charged with the essential microbic cause of infection. We can now understand why gunshot wounds, under the old methods of treatment, do constantly become infected. Dirty fingers and probes and infected dressing ma-

[1] [illegible] Navy Surgeon, etc. A Practical [illegible]
[illegible] Adams Surgeon, 1734

terials were responsible for the disastrous complications much more frequently than the bullet which inflicted the wound. Surgeons of that time hesitated in resorting to amputation, except in cases in which the limb was extensively crushed by large missiles and in cases of gangrene. Purmann, in amputating for gangrene, drew the skin upward, applied a firm circular bandage above the proposed line of amputation, and then, with one circular cut, divided all the soft tissues down to the bone, which was then divided with a saw. The skin was sutured over the wound, which was covered with the bladder of one of the large domestic animals, and over this a dressing, steeped in wine and rose oil. He always selected the morning hour for operation. His amputating outfit consisted of a saw, long curved knives, cautery iron, and astringent powder.

Atkins,[1] writing in 1734, on the indications for and technique of amputation, states under what conditions amputation should be performed. "When a limb is so shattered by a shot or splinter as to be entirely past a possibility of reduction; or when a wound (though not large) happens in a great joint, such as the knee or elbow; whence acute pains and convulsions are excited or probably would be, endangering life; and if healed, be not only useless but troublesome; or lastly, when any preceding hurt or distemper has induced a sphacelation,— there are other cases that may indicate amputation; but in these there is little room for suspense."

The following were his directions for preparations for amputation (page 119): "Your apparatus should be laid in three dishes: the first should hold your instruments — knife, cotton, saw, arterial forceps, and needles; the second, a lint pledget or two, half a score of others made of tow and different sizes, and with them a large round one, called a cap, spread with some astringent mass to cover the rest; and in the third, your powders and cross cloth." He used a tourniquet to control hemorrhage during the operation, tied the bleeding arteries, but did not suture the wound. All the soft tissues were divided by a circular cut on the same level down to the bone.

[1] Op. cit., page 118

WRITERS OF THE RENAISSANCE OF MILITARY SURGERY

Under this heading, I will give brief sketches of the treatment of gunshot wounds, as laid down in a few of the most notable works on surgery and military surgery, written during the period of transition from ancient to modern methods.

Lorenz Heister[2] was unquestionably the ablest surgeon of his time. His book, in many editions, remained a recognized authority for a century. The first edition appears like a modern text-book when compared with those written only a short time before. He discusses the nature and treatment of gunshot wounds with an erudition that surpasses anything written before on this subject. He attributes the rarity of severe hemorrhage to the character of the wound, the bullet producing an eschar. During the period of separation of the eschar, secondary hemorrhage is liable to occur. This eschar is not the result of cauterization by the bullet, but the consequence of contusion of the soft tissues. He discredits the idea, so long entertained, that gunshot wounds are poisoned wounds, because neither the powder nor lead contain any poisonous substances. The grave complications are caused by the contusions inflicted by the bullet. Tangent shots of the skull may produce serious intracranial injuries by commotion and tearing of the vessels without fracture. Many of such cases prove fatal if trephining is not performed for the removal of the extravasated blood. All internal injuries inflicted by a bullet are more serious than if caused by other implements, because the contusions are more extensive; but even these are amenable to successful treatment if the large blood-vessels escape injury. Penetrating wounds of joints are especially dangerous. All foreign substances must be removed, or else the wound cannot heal. The treatment of gunshot wounds consists in removing all foreign substances, arresting hemorrhage, elimination of contused lacerated tissues by promoting suppuration, after which healing by granulation and cicatrization will take place under appropriate treatment.

If the bullet can be seen, it must be removed with forceps or hooks. If it is not in sight, it

[2] Chirurgie, etc., etc., Nürnberg, 1747.

must be searched for with probe and removed before swelling sets in, as at this time patients are more submissive to treatment and suffer less than later. Attention is called to migration of bullets lodged in the body, and the greater difficulty in finding them under such circumstances. In grasping a bullet with forceps, carefully avoid seizing important structures, such as blood-vessels, ligaments, and nerves; consequently the blades of the forceps should not be opened until the instrument is in contact with the bullet. If the wound of entrance must be enlarged, incision should be made in the direction of the muscular fibers, and at a safe distance from important structures. Place patient in position he occupied the moment the injury was received, in order that the probe can follow the track made by the bullet. If the bullet is nearer the surface on the opposite side of the wound of entrance, make an incision over it and extract it. If the immediate risk of an operation is too great, it is advisable to postpone it until suppuration has set in, when the bullet can usually be found and removed with less difficulty. If the bullet is lodged in one of the large cavities of the body, no attempts should be made to remove it, but efforts must be made to heal the wound, as bullets are well tolerated in such localities, and may remain indefinitely without causing any serious results. If a bullet has become impacted in a bone and cannot be removed in any other way, it must be withdrawn with the *tire fond*. If it is deeply located, the extraction must be made through a tube passed down to the bullet. If a bullet has penetrated a joint, it should be removed as soon as possible, as its presence in such a location provokes grave complications. In gunshot fractures, with extensive splintering of the long bones, it is advisable to amputate at once. If amputation is not indicated, the wound must be enlarged and the fragments removed. If a large artery has been severed, make digital compression over a compress applied over the bleeding point, apply tourniquet, and seek for the bleeding vessel and pass an armed needle under and around it, and tie. After foreign bodies have been removed and hemorrhage arrested, pour warm whiskey into the wound, or, what is still better, camphorated spirits of wine, or warm wine mixed with a little whiskey or lime-water, with camphorated spirits of wine. Over the wound is applied a compress, saturated with one of these preparations, and which must be retained in its place with a bandage. Suppuration must next be induced, and this is accomplished by applying an ointment made of the yolk of egg and turpentine. If a foul, profuse discharge ensues, add to the digestive salve, myrrh and aloes or theriac. If the bullet has passed through a limb, pass, with a long-eyed probe, a strip of linen through the entire length of the tract. Grease the linen strip with digestive salve at first and at each subsequent dressing, and leave it in place until the wound is clean.

The wound water, *eau d'arguebussade*, or a wound balsam promotes the healing process. The Egyptian ointment is recommended alone or mixed with alcohol, when the wound is sluggish in healing. If local mortification takes place, incise the dead parts, to remove the foul secretions, and use the eating water (Fresswasser), *aqua phagedenica*, composed of lime-water and sublimate of mercury. He does not mention bleeding, cupping, or the use of any depressing internal remedies; on the contrary, advises stimulants and nutritive diet to support the strength of the patient. These few extracts suffice to show the sagacity and good judgment of Heister, in the treatment of gunshot wounds nearly two hundred years ago; and, as we shall see farther on, his teachings dominated surgical thought for more than a century. His utterances sound like voices in the wilderness, announcing the dawn of a new era in the history of military surgery. Dionis, a French military surgeon of note, writing in 1777,[1] taught surgeons the art of extracting arrows and darts, as he said armies who had discarded the use of bow and crossbow might have to fight barbarians, and in such an event surgeons should know how to deal with such wounds. He advised to change the figure of the bullet wound from round to longitudinal, by two cuts with the bistoury in opposite directions from the wound of entrance, in order to convert it, as nearly as possible, into the shape and nature of an incised wound.

[1] [illegible] First Ed., 1740.

After establishing drainage, he closed the wound in part by suturing. As a wound application, he recommended the *eau d'arquebussade,* lint compress, then plaster compress, moistened with brandy or aromatic wine. He emphasized the necessity of removing the bullet, as otherwise the wound could not heal.

"Car tant que la plaie, il n'est pas dans son pouvoir de la Guérir, parce qu'il est un obstacle à la réunion, qui est la fin qu'on se propose dans la guérison de toutes les plaies." He says this statement must not be taken literally, as in very exceptional cases the reverse is true. For us Americans, the text-book on military surgery, used by our surgeons during the war with England, is of special interest. It was written by the surgeon-general to the British army, John Ranby, Esq. The book is a small one, and contains, besides, a chapter on diseases incident to armies, by Baron von Swieten, translated from the original; and about one third of it is written by an American, John Jones, Professor of Surgery in King's College, New York, the title of which is "Plain Concise Practical Remarks on the Treatment of Wounds and Fractures, to which is added an appendix on Camp and Military Hospitals." The book was published in Philadelphia, in 1776, and was intended for our military and naval surgeons. Mr. Ranby, the British surgeon-general, had learned the ill effects of the too frequent use of the probe in searching for bullets. He says: "In order to get at the ball, or any other foreign matter that infests the wound, I would advise probing or poking to be used as sparingly as possible; having constantly experience, through the whole course of my attendance in these cases, that such a method is highly detrimental to the patient; and, indeed, where probing is necessary, I would always prefer the fingers as the best and truest probe." He speaks of the frequency with which bullets lodged in the tissues remain without causing any serious difficulty until, after many years, they have worked themselves a passage towards the surface, and were consequently easily extracted. He calls attention to the gravity of wounds implicating large joints. Early venesection is recommended as a prophylactic against inflammation. "Let the first dressing be with lint, dry, or moistened with a little oil, and a very light bandage; the next with a digestive warmed, and over it the bread-and-milk poultice, mixed with a sufficient quantity of oil to keep it moist; and where there is a great tension, and the wound large, a fomentation. This course is to be continued till the sore is clean, and then it is to be healed according to art." In grave gunshot injuries, he advised early amputation. Opium, bark, and aromatic sulphuric acid were his favorite medicines in the treatment of the wounded. Professor Jones practically gives the same directions in the treatment of gunshot wounds as Mr. Ranby, and the same general treatment of the patient. Both of these authors speak of the frequency of secondary hemorrhage, and advised in cases in which such an accident is to be expected, Petit's tourniquet should be applied above the wound, to be tightened the moment hemorrhage occurred, to be followed by ligation of the bleeding artery. From the above notes, it becomes apparent that the English and American surgeons of that time were far behind the progressive ideas of Hilden, of half a century before. Either these surgeons were not familiar with the teachings of Hilden, or the art of surgery had retrograded during the intervening time.

We will now consider, very briefly, the work of the most famous surgeon of the period of awakening of military surgery, Baron Larrey. This leading light of surgery on the battle-field is best known in history as the most intimate friend, and one of the few trusted advisers of the greatest soldier the world has known — Napoleon Bonaparte. It is safe to affirm that Baron Larrey had a larger and more varied experience as a military surgeon than any one before or since. He was a military surgeon for more than half a century, and participated in twenty-four military expeditions in three continents. He was with Napoleon during the most eventful period of his military career. Of humble birth, and after many hard struggles in obtaining his medical education, he gained, by his genius and faithful attendance to his duties, the recognition and confidence of his commander. He was chief surgeon of the army of the Rhine in 1793; and, on more than one occasion carried wounded soldiers through a rain of bullets to the rear. In 1792 he in-

stituted the flying ambulances, drawn by one horse, and so arranged as to carry two wounded.

In Egypt, he employed pannier bearing camels for the transportation of the wounded; and introduced plastic fixation dressings in the treatment of gunshot fractures. He and all his surgeons were mounted, in order to render prompt aid to the wounded. A case, holding the necessary instruments, was fastened to the saddle. He made several Chopart's amputations in Egypt, although he was not aware that Chopart had previously described the same operation in 1791. He made the tarso-metatarsal amputation of the foot, performing what is now known as the amputation of Lisfranc. Larrey was an advocate of primary amputation in all grave gunshot injuries of the extremities. He employed the circular method, making several cuts. He advised amputation in all cases of penetrating gunshot wounds of the large hinge-joints. He was likewise a warm advocate of trephining for intracranial hemorrhage. His treatment of gunshot wounds was noted for simplicity. He used warm salt solution for recent wounds, and Labaraque's solution for putrid, sloughing wounds. He placed great stress on rest as an important element in the treatment of wounds, and consequently was opposed to frequent changes of dressing and meddlesome surgery in general. Among the many improvements, made for the wounded on the field of battle, by Baron Larrey, not the least is the introduction of temporary field hospitals as a regular and constant feature of the medical corps, and the prompt dressing of the wounded, and their speedy transportation to a place of safety, or the near-by field hospitals. Larrey was not only a great surgeon, but took great interest in natural history and the sciences. His travel notes, during his many campaigns in distant lands, as recorded in his Memoirs, show a diversity of knowledge on various subjects, which shows the greatness of his genius and the profoundness of his learning. An eloquent tribute to the memory of this the greatest of all military surgeons was recently paid by Professor J. Chalmers Da Costa, before the Johns Hopkins Historical Club.[1]

The name of Baron Larrey stands out in bold relief, like a beacon-light, directing his contemporaries and successors forward and onward in the direction of true progress. By his impressive teachings and brilliant example, he showed his colleagues what a military surgeon should be, and laid the foundation upon which to build the enduring structure of modern military surgery. The life-work of Baron Larrey kindled a perpetual brilliant light, which announced the approach of the dawn of modern military surgery.

SURGICAL ASPECTS OF VARIX OF THE LOWER LIMBS

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OF late, many operations have been proposed for the cure or alleviation of varicose veins. These methods are much alike in principle, their object being the extirpation or interruption in continuity of the offending vein or veins; and while the technic has been much improved, it must be confessed that these procedures vary little from those adopted by Severinus and Fallopius. In recent years, little attention has been paid to the etiology and pathology of the disease, and personal talks with some surgeons of the widest experience in this line have but served to emphasize the fact that these subjects, which should be the basis of all operative interference, have, in the case of varicose veins, been sadly neglected. A glance through the literature, most of which is old, is not reassuring, for the reader is overwhelmed by a mass of conflicting statements which throw his

[1] Baron Larrey: A Sketch. Johns Hopkins Hospital Bulletin, vol. X, No. [illegible].

mind into a mental chaos. The apparent benignity of superficial varices has made their study neglected; and yet there are few affections which lead to more varied and sometimes more serious complications. Again, their position suggests a simple causation, and extirpation as the remedy.

Much of the confusion in the literature arises from a loose use of the term "varix," many of the writers making the term synonymous with simple dilatation. Sir Benjamin C. Brodie (1) was one of the first to make a clear distinction between tortuosity from obstruction and varicosity, which is essentially a diseased condition. It is generally not difficult to distinguish these two classes of venous enlargement, but there are instances in which the one will merge into the other; we sometimes find veins which macroscopically would be regarded as simple dilatations, and yet which show, on more careful examination, microscopic changes in their walls.

Varix of the lower limbs is so frequently met with, that the treatment of it and its complications forms a considerable part of the work of any out-patient clinic. Wood, (2) in conducting civil service examinations for the positions of firemen and park police, found varicose or dilated veins in the lower extremities of 91 out of 2,004 applicants examined, or 4.5 per cent. The statistics of the United States army (3) on this point show that in 1904 the rejections for varix were 3.92 per cent; in 1905, 2.49 per cent; and in 1906, 2.13 per cent. Out of over two million men examined for the French army, from 1850 to 1859, inclusive, the exemptions for varices were .973 per cent. (Sistach.) (4)

My observations are based on one hundred cases of varix, under my care in the out-patient clinic of the University of California. While my findings agree in many respects with the tables already published, they nevertheless depart considerably in certain details. Our patients have been mostly men, and the larger portion have consulted us for varicose ulcer. In this service, however, the number of male patients has always been far in excess of the females; and it is a notable fact that the poor patient, afflicted with varix, does not generally seek surgical aid until some of the annoying sequelæ appear. In our hundred cases there was not one which we could attribute to a heart lesion, although this cause is commonly mentioned in surgical text-books. Miller (5) in a summary of 128 cases of varix, from the records of the Johns Hopkins Hospital, makes the same observation. Many of our patients complained of constipation, but in no instance could it be regarded as a causative factor. Abdominal tumors were met with in but 3 cases. (In 33 cases of ovarian and pelvic tumor, with varicose veins, Gay (6) found the veins apparently aggravated by the tumor in but a single instance.) Hemorrhoids were found in 10 patients. The occurrence of well-marked varicocele was recorded but 6 times. For a while, I examined the forearms of all patients for enlarged veins; but the number met with was so small that I abandoned the procedure as a routine measure. Seven patients gave a history of the appearance of the offending veins after fractures of the limbs.

Heredity has for years been counted as the most important factor in the etiology. Broussais (7) was the first, I believe, to emphasize this point and Richet (8) thought that there existed in certain cases a special predisposition by which the venous walls, already enfeebled, become hypertrophied. Berard and Denonvilliers (9) state that, in some cases, heredity plays an incontestible influence. Bennett (10) obtained a hereditary history in 74 patients out of 259 examined. Our own experience has led us to believe that such information, gained by questioning the patient, is most unreliable. The patient himself is unable to distinguish between prominent or dilated veins and the condition with which he is afflicted. We have found that his answers would largely depend on the ways in which our questions were put. There is every opportunity for the enthusiast in heredity to make a serious blunder in this connection. In three instances, however, we have treated more than one member of the same family for varix. In my review of the literature I have been interested in reading the statistics of Moreau (11) who assigns to rheumatism the chief place in the etiology. In 118 cases he found 53 with arthritic manifestations and 24 with a family history of rheumatism. Yet to-day we would hardly deign

to place rheumatism among the predisposing causes. It is noteworthy, that in this series he found but 6 with a family history of varicosity alone.

I regret that the Trendelenburg (12) test was not tried in all our cases. In many, in which it was practiced, it was not done correctly, as I will later show: so I have no statistics to offer on this point. The Trendelenburg test is made as follows: The patient is placed in the recumbent position and the limb raised so as to empty the superficial veins of venous blood. The fingers are then pressed firmly over the long saphenous, just below the saphenous opening, and the patient allowed to stand; the lower veins may now fill somewhat on account of their anastomoses with the deep veins. The pressure is suddenly removed; and in most cases, if valvular incompetency is present, the blood can be seen to rush down the empty vein, again distending it. This is the usual method of employing the Trendelenburg test, and it was so applied in a large number of our cases. But Pierre Delbet (13) has shown that an internal saphenous vein, which may appear normal in size, may be the seat of valvular insufficiency. If, in such a case, the fingers be placed upon the vein at some distance below the saphenous opening, a thrill will be felt immediately when the pressure is removed, although the vein may not visibly dilate. We have found this to be so in many instances in which the Trendelenburg test, as usually applied, proved negative. The amount of subcuticular fat, interposed between the vein and the skin will make a difference with the visual perception of this test. When the varix is well marked, there is a tendency for the superficial fat to be absorbed. Delbet goes so far as to affirm that, in no instance in which a varicose ulcer was present, has he ever found the saphenous vein intact. This has not been our experience, although we have found the modified test positive in a large number of cases.

As has been generally noted in statistical records, we have found a large percentage of our patients following those occupations which require standing for long periods with little chance for exercise, such as motor-men, counter clerks, bartenders, laundry-men. Albucasis (14) has commented on the influence of occupation on the production of varix and Briquet, (15) Boyer (16) and Longet (17) have emphasized his conclusions. The disease appears to be common in those who sit for long periods in one position, particularly when the muscles of the arms are brought into play, as in hackmen and wagon drivers. Manley (18) has met with it frequently in those who use the bicycle much. This author points out that in fast bicycle riding, when the trunk is bent forward, when all the muscles are in most energetic action and the thigh intermittently flexed upon the pelvis, venous return is greatly embarrassed. deGuillejac (19) has also found the disease common in those whose limbs are accustomed to certain set motions, as bicyclists and turners.

It has been impossible to establish the age of onset in our series. The general answer has been, that the varix has been present for a great many years or as long as the patient can remember. It would seem, however, that in a majority of cases the disease has its beginning between the twentieth and thirtieth years, and that its sequelæ are noted at a somewhat later period. The average age of our patients was thirty-six. In this connection the labors of Sistach (20) are interesting. He examined 1074 French soldiers. In 956, from twenty to thirty years of age, he found 73 cases of varix, or 7.53 per cent. In 118 soldiers, from thirty to forty-six years, he found 23 cases, or 19.49 per cent. Again, Delaharpe (21) records the statistics of the canton of Vaud, Switzerland. Here the militia is divided into three parts: *le depot*, composed of boys from seventeen to ninteen years of age; *l'elite*, of men from nineteen to thirty years of age; *la reserve*, of soldiers between thirty and forty-five. The exemptions for varix were about the same in the first and third classes, but nearly double in the second class. This represents very well the age of onset, for it must be understood that the soldiers of the higher divisions had already seen service in the lower ones.

A casual survey of an injected specimen of the superficial veins of the lower limbs, or even a text-book illustration, conveys the impression that we have here a most elaborate arrangement for the return of the superficial venous blood, wholly out of keeping with the neces-

The internal saphena vein and its branches. The most common distribution of the vein is shown.

sities of the body. It has long been recognized that this superficial venous system offers to the returning blood an unobstructed passage to the heart during the time that the venæ comites are undergoing compression by the contracting muscles. We know that this contraction materially assists the onward flow of the deep venous current, for in a state of muscular relaxation the blood pressure in the veins is low. Yet, while at one moment muscular contraction would accelerate the deep venous current, it would the next moment be turned into an opposing force. If muscular contractions were rhythmical, this would not be the case and there would be no necessity for nature to provide such an elaborate system of superficial venous return. The increased volume of blood, thrown into the superficial veins by muscular action, is a matter of common observation. It can easily be demonstrated in a race-horse, fresh from a heat; and I have often observed this distention of the superficial veins in the legs of athletes, especially after middle distance runs. Slow laborious exercise will also distend the veins, but to a less degree.

In the accompanying diagram, the paths of the superficial veins are marked and the common positions of the valves indicated. These valves vary considerably, in number and position, in different individuals. Though fine and delicate structures, their power of resistance is sometimes remarkable. I have tried to force these valves in the long saphenous vein of the new born infant, but have never succeeded in doing so. The experiment is a most delicate one, for the vein is here not much larger than a coarse hair. With patience a fine needle may be inserted but the valves have remained intact, notwithstanding all the force I could bring to bear upon them with a syringe. In this connection, the extensive experiments of Klotz (22) are of great interest. He observed that, with advancing age, more and more of the valves become insufficient. In every case he found the valves intact in the fœtus and the new born. At the age of twenty-five, 17 per cent of the valves were insufficient; at forty-eight, 29 per cent; at fifty-four, 40 per cent, and at seventy, 81 per cent. In the pieces of diseased veins which I have examined, I have found in all instances that the valves had disappeared. The same observation has been made by Kræmer (23) and Venot (24).

Certain points in the anatomy are to be emphasized. Tracing the internal saphenous upward, its most constant branches, those establishing communication between the superficial and deep systems or between remote parts of the same trunk vein, are: A branch, 1, to the external saphenous, which also sends a branch to the deep plantar vein. As the internal saphenous passes over the malleolus it gives off a loop vein, 3, which receives many branches, sends other branches to the deep plantar veins and usually rejoins the trunk vein higher up. This loop vein sends a branch to the posterior tibial, 2, the inferior perforating vein. The long dorsal vein, 4, runs upon the dorsum of the foot where it communicates freely with the anterior tibial, the saphena and the plantar veins and then ascends the leg upon the outer side of the tibial spine. Sometimes this branch prolongs its course by the dotted lines to unite with the branch above, giving rise to what Viannay (25) calls a double saphenous vein. In 52 dissections, he found it present in 6.5 per cent. Its existence was first pointed out by

John Gay (26) and its bearing on the so-called Trendelenburg operation is obvious. At 5 this vein receives a large branch which connects the saphenous with the posterior tibial venæ comites.

Besides these veins, there are two others of prominence not shown in the diagram. The short dorsal vein completes the outer portion of the dorsal arch, communicates freely with the plantar veins and also the external saphenous and passes up the leg in front of the fibula for a varying distance. It sends a branch also to the posterior tibial, the middle perforating. A branch, sometimes quite large, arises on the outer side of, and immediately below, the knee-joint, where it communicates freely with the deep articular veins. This crosses the leg and unites with the saphena on its inner side. Slightly below this is a branch to the deep veins (not figured), the upper perforating. 6, A large branch as shown in the illustration. Above the knee, the branches follow in general the directions given in the diagram and a description of their paths is not necessary. The internal saphena has usually seven valves.

The external saphena is but partially drawn. Its important branches are several small veins on the outer side of the ankle-joint which anastomose with the plantar, dorsal and posterior tibial veins. About 5 or 6 cm. above the ankle is a branch from the peroneal or posterior tibial vein. 7 is a cross branch, from the external saphena to the internal saphena. A large branch, 8, runs upward and joins the internal saphena behind the knee-joint. Another branch higher up (not figured), connects the external saphena just below its termination with the internal saphena at a varying distance above the knee-joint. The external saphena has from three to nine valves.

It will be seen from the above, that the saphenæ inosculate freely with each other upon the dorsum of the foot, and also send a number of branches to the deep veins. Perforating branches to the deep veins are also to be found, just above the ankle. At the knee-joint and just below it some of the superficial veins are connected by branches with deep veins; but between a point a little above the ankle and a point just below the knee, there are but two perforating branches, the upper perforating and middle perforating, which join the superficial with the deep system. In the thigh there is occasionally found a perforating branch which passes up and joins the femoral vein. The external circumflex, superficial pubic and superficial epigastric veins, shown in the diagram about the saphenous opening, inosculate freely with the deep veins.

Clinically, we may roughly group our cases into three classes.

1. The occurrence of varices in a limb notably enlarged. Such a limb is often œdematous, or in the absence of œdema, a flabby fullness is observed when the part is raised. This flabbiness becomes hard and resistant when the limb is again lowered. Ulcers, which heal with difficulty, are frequently encountered; and areas of pigmentation, which may mark the site of old ulcerative processes, are often seen. The varicosities are most generally slight and wholly out of keeping with the sense of weight and fullness which the patient experiences when walking. The internal saphena is usually not the seat of extensive varix and is often not palpable. The veins on the dorsum of the foot and about the ankle are more or less varicose and varicosities are seen on the inner and outer side of the ankle-joint and just below it. Between the ankle and the knee-joint there may be one or two clumps of veins, varicose to a varying degree; if present, they will correspond to the positions of the middle and upper perforating veins. In other words, we have in this class varicosities of the superficial veins in the immediate neighborhood of the anastomosing branches which join the superficial with the deep system.

2. The occurrence of marked varix in a limb not appreciably or but slightly enlarged. The internal saphena is prominent especially in the leg, and its branches are frequently hard and tortuous. The Trendelenburg test is present. Old phlebitic areas and phleboliths are often found.

3. The occurrence of isolated patches of varix in different parts of the leg and thigh of a limb not appreciably or but slightly enlarged. The internal saphena may be palpable at certain points, but the Trendelenburg test is absent.

Such a classification answers, in a general way, the purpose of simplifying a very complicated subject and will be referred to later in connection with the operative treatment. It may here be noted that varix is generally more advanced in the branches of the saphenæ than in these veins themselves; also that the anatomical arrangement, as above described, is capable of great variation.

The conditions existing in our first classification lead us to inquire into the nature of the deep veins. Briquet (27) was the first to assert that, at the spots where the superficial varices are most common, large trunks communicate through the muscles with the deep veins. He finds the latter as commonly diseased as the superficial, the disease being most advanced where the intramuscular veins empty into them. Callender (28) confirms his statement. It is rather surprising that, with the increased attention that has been given to necropsies of late years, nothing has appeared on the subject of the deep veins in superficial varix. A number of observations have been made, but they date back to that distant time when varix was a subject under discussion.

Verneuil, (29) in 21 dissections, extending over a period of 6 months, states that in every case where superficial varices were discovered, deep varices existed as well. He even goes so far as to affirm that here varix is more common and that the deep veins are the first affected, the disease spreading from them into the superficial plexus, the anastomotic channels between the two sets being varicose to a high degree. His commentators convey the impression that he found the deep veins generally varicose, but he distinctly states that the plantar, the popliteal and the femoral veins are rarely affected and the anterior tibial almost never. It is to be regretted that Verneuil did not publish an account of his dissections in detail. One dissection only he mentions. This was on the body of a woman, one of whose legs contained superficial varicosities. On the opposite side, while the superficial veins were not varicose, the deep veins were markedly so. In reading his paper, one is forced to believe that his conclusions are not justified by the material which he presents.

Quénu (30) reports many cases of superficial varices in which alterations of the deep veins did not exist. Broca (31) states that he has found varix of the deep veins in cases of superficial varicosity. He has dissected a subject in which the superficial veins were intact, but where the deep veins were dilated to a very high degree. Denuci (32) found one case in which the deep veins were greatly dilated, but no dilatation of the superficial was present. Verneuil (33) quotes Deville, Fouché, and Sappey, all of whom had found the deep varices very common. Dumay (34) communicates a case in which, while tying the peroneal artery, it was found to be surrounded by large varicose veins, the walls of which were extremely thin. Briquet (35) states that he has seen one case at the Salpetriére in which, though the external parts of the legs and thighs were covered by large veins, the deep veins were free from all signs of disease. Sirus-Pirondi (36) in a letter addressed to Verneuil, says that in a year he has encountered seven times deep varices without a trace of superficial varix. In 1855, before the Anatomical Society of Paris, Verneuil (37) exhibited a specimen in which the deep veins were generally more dilated than the superficial. Gross (38) has recorded a dissection in which all the superficial veins of the leg were found to be varicose to a striking extent, as were also the deep veins, but to a less degree.

Bennett (39) believes that, in the greater number of advanced cases, the deep and superficial veins are probably involved to about the same extent. Hughes (40) has made four dissections in cases of varix and found that in each the long saphenous was varicose. The only portion of the short saphenous affected, was that part lying in the popliteal space after it had pierced the deep fascia; this was distinctly varicose in each case. He found, in no instance, any of the deep veins affected. He believes that the portion of the short saphenous lying in the popliteal space becomes varicose because it is not supported by the contracting muscles. Walsh (41) has seen one case of varix dissected and states that in this the internal veins were as tortuous and irregular as the external.

Gay's (42) work, published in 1868, is the best and most thorough which has been done

on this subject. He made in all 24 dissections, and published an extensive protocol of his findings. In these dissections, some portion of the deep veins was found to be dilated or permanently thickened in 13 instances. Dilatation of intra-muscular branches is also mentioned in 4 dissections. In 2 dissections, the external saphena presented constriction at the deep aponeurosis. Atrophy of the saphena, with deep trunk dilatation was noted in one case. This author makes reference to a fact, which is a matter of common observation, that the severity of the ulcerative process does not correspond with the extent of the superficial varicosity. Obstruction to the deep vein trunks was found in some cases. In one instance, the external iliac vein had been almost obliterated by pressure of a cancerous tumor of the uterus; the superficial veins were largely developed over the upper part of the thigh but not below. Gay believes that it is not the tributaries of a vein below the seat of obstruction that become varicose, but branches which bridge over its site. In his dissections the posterior tibial venæ comites were the most frequently affected.

From the above, there can be no doubt that the deep veins of the leg are frequently dilated; and it will be pointed out later that, where deep dilatation exists in the presence of superficial varix, these deep veins are varicose as well.

The occurrence of dilated veins in the course of pregnancy is very common. Of 300 women examined by Budin, (43) 152 were primipara and 146 multiparæ. There were 34 cases of dilated veins among the primiparæ and 66 among the multiparæ. These dilatations usually subside after pregnancy and so should not be considered as varix; but there are many instances, in which such dilated veins become varicose after repeated pregnancies. In this connection, the experiments of von Lesser (44) are interesting. He endeavored to produce varicosities in animals by introducing artificial obstructions in their veins, but was successful only in getting a compensatory dilatation, the result of venous anastomosis. It is not unreasonable to believe that varix would have in time resulted in his experiments.

A number of instances are found in the literature of cases in which large, dilated veins, called varices by some of the writers, have suddenly appeared after violent muscular exertion, as dancing, running and the lifting of heavy weights. Ambroise Paré, (45) whose keen observation is amply testified by his writings, mentions such occurrences. Bennett (46) cites the case of a male patient who suddenly felt something give way while engaged in gymnastic exercise. On examination the saphena above the knee was found to be twice the size that it was below. Manley (47) mentions a patient who, in racing on a wheel, ruptured the muscular coat of the internal saphena from the falciform ligament to the knee, the vessel attaining a diameter nearly as large as the wrist. Such instances are most interesting, for they serve to show what great pressure may be exerted on the superficial veins by muscular exertion. More will be said on this subject, in connection with the rôle of valvular incompetency in the production of varices. There is not doubt that some cases of varix have their origin in the severe muscular strain undergone in certain athletic sports, valvular incompetency resulting from overloading the vessels. I have not found this commented upon excepting in the writings of Bennett; but the frequent occurrence of varix among patients who have been most athletic in their youth would lead one to consider it as a causative factor. A perusal of the clinical facts, here set forth, leads the reader at once to the formation of a simple theory as to the origin of varices. The mechanical or physiological theory, as it is sometimes called, was for a long time generally accepted, due no doubt to the great emphasis which was placed upon it by Briquet (48). According to Briquet, the prime cause for the production of varix is the increased tension in the superficial veins. Permanent varix follows their dilatation.

Against this mechanical theory has been advanced the doctrine that varix is due primarily to a parietal phlebitis, which results in the destruction of the muscular and elastic tissues replacing them by fibrous cicatricial tissue. The cause of this alteration is laid to a diathesis, the disease being common among alcoholics, sedentary women and those who present nutritive changes. This is the theory which has been defended so ably by Schwartz

(49). Cornil (50) also asserts that, after the development of thrombosis, hypertrophy ceases and the hypertrophied elements enter into a secondary atrophy. The assumption that a special diathesis is necessary for the development of varicosity hardly seems to be warranted by the clinical facts. The disease is very common among those who are otherwise healthy, strong and robust and free from organic changes. But in many old cases of varix, dissection shows intravenous coagulation, partially filling the vessel's calibre. Often this undergoes calcareous change, and palpation of the affected vein reveals hard nodes (phleboliths) obstructing the lumen. Sometimes inflammatory changes will entirely obliterate a vein, the so-called radical cure. Certainly, there is much which can be said concerning the presence of phlebitis in varix, the only question left open being its place as a causative factor.

One clinical fact of considerable importance I wish to mention before seeking, in a microscopic study of varix, a settlement of this question. In some cases after operation, especially when the internal saphenous has been tied or a portion of it has been excised, the blood will be shunted through collaterals and a venous anastomosis formed. Clinically, this is first marked by a slight dilatation of the branches involved; after a while this dilatation becomes greater and finally an hypertrophy of the coat is observed, for the vein walls are thicker when picked up between the thumb and forefinger, and more resistant to pressure. In the course of time, the walls increase and may become tortuous from the growth of connective tissue; our anastomosis is now a typical varicosity. Here it can hardly be claimed that a phlebitis was the point of origin, for it was simply mechanical pressure, the necessities of the circulation, which developed the anastomosis. We can believe that venous dilatation is the first step in the development of a superficial varix, the result of abnormal blood-pressure. What tissue changes occur to offset this increased blood-pressure has been determined by a careful study of specimens microscopically. Many of the sections for this work have been prepared for me by Dr. Harry Everett Alderson.

Resistance against increased blood-pressure is first made by the elastic tissue in the walls of the vein. An hypertrophy, sometimes most pronounced, results. Even this hypertrophy is often insufficient and the vein will continue to dilate, the walls becoming quite thin. The muscular tissue then begins to hypertrophy in order to overcome this dilatation; and the thin walls may, after a time, become quite thick. The vein may also assume a tortuous course, due to its unequal development. Agnew (51) has likened such a vein to the course of a river and he says, "The effect of one curve is to reflect the circulating current forcibly against an opposite and higher point of the vein and to cause another curve in that direction. A bed may be cut for a stream whose sides are geometrically parallel, and yet, if left unrestrained, it will soon groove out for itself a channel like the trail of a serpent, because a slight indentation was formed on one of its banks." Such a comparison is more fanciful than real, for the vein in its pathological development in no way follows the geological laws which govern river channels.

In my examination of specimens, I have never found in veins with thin walls, where thrombus was not present, the muscular layer atrophied, but sometimes it has been a little hypertrophied. Soboroff (52) has recorded the same fact. It is to be noted also, in the greatly dilated veins in which the walls do not seem to be thickened, that a considerable hyperplasia and remarkable elastic hypertrophy exist microscopically. The elastic tissue is much more hyperplastic in veins with thick walls than in those in which the walls are thin; but this hypertrophy does not always compensate for the dilatation present. The deep veins, secondarily thickened, are yet nearly always distinctly dilated as compared with normal veins. Muscular tissue may also develop in great quantity in the adventitia. Pilliet (53) has noted a specimen in which the vessels of this coat were distinctly dilated and engorged with blood. There may be also a bed of new formation, of variable thickness, developing in the intima and enclosing the lumen completely or partially.

We find, then, hypertrophy in all the layers of the vein, the purpose of such hypertrophy being to meet the augmented blood-pressure.

In many instances compensation is established, but the lumen is nearly always slightly dilated. If the venous pressure continues to increase, the lumen of the vein redilates and the elastic and muscular tissues of the new formed layers begin to atrophy and disappear. This secondary atrophy has been especially emphasized by Epstein. (54) When this occurs, a thrombus may form or the wall may break. In the presence of thrombus, degeneration of the intima is frequently noted; also sometimes that of the media and occasionally that of the adventitia. But it does not follow that the thrombus, composed as it is of coagulated blood, fibrin, and leucocytes, is a direct consequence of the degenerative process in the wall of the vein. Broca (55) lays stress on trauma and fatigue as determining causes; and many other causes, both local and general, are cited by him. It is possible that the atrophy of the intima which is present directly provokes the blood stasis and thrombus formation; at any rate, we are led to believe, from the presence of thrombus in a section, that it serves as a protective to the degenerated walls.

Menahem Hodara, (56) whose work on this subject in Unna's clinic is most extensive, has examined several specimens in which the walls of the vein had broken down. In these sections the blood, which by destruction of the walls is in contact with the tissue, is retained by a thick layer of new formation which is thrown around the defective part. This blood proceeds, destroying a portion of its artificial barrier, and advances but slightly before it is again stopped by a new circle, probably formed after rupture of the first. By this process the lumen of the vein is slowly and irregularly enlarged. The blood circulates perfectly and there is no evidence of thrombus formation. The process, in general, is the same for all the veins but local tissue differences produce variations in the histological picture at different levels. The greater resistance of the cutaneous tissue, rich in elastin, permits but very slow progress. On the other hand, the relaxed subcutaneous tissue, poor in elastin and already possessing a quasi-cavernous character from the presence of adipose tissue, allows of greater inroads.

Contributory causes to the development of varix have already been mentioned and, outside of occupation which has been commented on at length, they may be classified as follows:

1. Obliteration of a large vein, generally a deep one, by thrombus following typhoid fever and other diseases.

2. Obliteration of, or pressure on, a large vein or veins as the result of fracture. As already stated, this was observed in seven cases of our series.

3. Interference with the return circulation by the pressure of constricting bands, such as elastic garters, commonly worn by men above the calf. This I regard as a most important secondary factor in those cases in which a tendency to the disease already exists. Bennett (57) affirms that fully 25 per cent of his cases were due to this cause. Freer (58) has observed such a number of cases of varix develop quickly in British troops, who have seen active service in South Africa, that he believes it to be due largely to the improper adjustment about the legs of the putties commonly worn. Garters, as a causative factor, was noted frequently in our series and the following case, seen in private practice, well illustrates this point.

A commercial man of thirty consulted me for pain in his legs. He described a peculiar numbness, hardly noticeable in the morning but getting worse gradually as the day advanced. On the least exertion, there was more or less aching in the calf muscles and, sometimes, persistent cramps. On examination, I found that he wore rubber garters above the calves; he stated that he had been wearing them for about two months time. The legs were of medium size, the superficial veins distended with blood, especially on the dorsum of the foot, and some were varicose. The walls of each internal saphenous seemed slightly thickened, but the Trendelenburg test was absent. The patient stated that he thought the veins had become enlarged while at college; he had taken an active part in athletics, especially upon the track. I advised him to dispense with the garters and he has not since been troubled with these annoying symptoms.

4. Interference with the return circulation by the pressure of tumors. This, as has already been stated, is rare.

5. Gay, (59) from his many dissections, was led to conclude that constriction produced on the veins by certain foramina, such as the saphenous opening, was at times a contributory cause in the production of varix. Sistach (60) emphasizes the fact that, in certain cases, the varicosities would seem to be the result of strangulation at the aponeurotic or fibro-muscular orifices. Herapath (61) has even gone so far as to advocate a widening of the cribriform fascia which gives passage to the saphenous vein.

6. Pressure of venous blood, resulting from valvular incompetency. This is, by far, the most important and the most common of the contributing causes. Trendelenburg (62) has emphasized its bearing in relation to varix and his test is founded on his accurate knowledge of the hydrostatics of the condition. It is, by far, the most useful physical sign in connection with the disease.

At this point, attention must be drawn to a remarkable experiment of Pierre Delbet (63) I have not had the temerity to repeat this experiment, though I have much wished to confirm his observations, for it is not without great risk to the patient. Having resected the internal saphena in a strong, healthy man in which the Trendelenburg test was present, Delbet proceeded to measure the blood pressure by introducing canulas into the central and peripheral ends of the vein and connecting them with manometers. He states that the conditions were all admirable, the blood did not coagulate in the tubes and the patient did not exhibit any ill effects from the experiment. Readings were taken simultaneously on the two manometers, with the patient lying down, during muscular effort while standing, and under very violent muscular effort in the same position. The readings are as follows:

	Superior Segment	Inferior Segment
Patient lying down	1.6 cm.	3 cm.
Muscular effort standing ..	16. cm.	6 cm.
Violent effort standing	26. cm.	10 cm.

Thus we see that, under violent effort, the pressure is raised in the central end to 26 cm., truly an enormous pressure. The pressure in the inferior segment can be considered that of a normal saphenous vein; and we find that, on violent effort, it is raised from 3 cm. to 10 cm. Normal arterial blood-pressure, at middle age, is given by Krehl (64) at from 10 to 13 cm., although muscular exertion markedly increases it. The experiment not only emphasizes the importance of the Trendelenburg test, but gives us some idea of the enormous increase in tension of the blood in the superficial veins during muscular exertion.

It is related by Plutarch that Marius, the Roman dictator, underwent an operation for the removal of varicose veins, as they spoiled the appearance of his calves. The dictator stood bravely the pain of the operation on one leg; but, when the surgeon was about to proceed with the other, he stopped him saying that the improvement in appearance would not compensate for his suffering. While it is not probable that, at the present day, a patient would be actuated, by the motives of Marius, at the same time there is a small number of patients in which the symptoms are certainly exaggerated. We have a like, but much larger class, afflicted with varicocele in whom only radical removal will suffice to free their minds from the mental worry attendant on the trouble.

The symptoms from which the varix sufferer generally complains are as follows: Pain in the legs, hardly appreciable in the morning, but gradually increasing as the day advances; there may also be a general numbness in the extremities, cramps in the legs or great itching of the skin, especially toward night. Œdema is seen in many cases and trophic changes are gradually developed. The skin of the leg may be hard, of a dark red to a bluish hue, and very liable to inflammatory conditions, especially to eczema. The muscles become relaxed and atrophic, and the patient is soon fatigued. Flat-foot is noted frequently in connection with varicosities on the legs.

The patient often wishes to know, for it is of great importance to him, how much exercise he should take and what kind. He has himself learned that long continued standing is productive of great discomfort. If his occupation is one that requires this, the question of a change of employment should be considered; although at the middle or later periods of life, when the results of varix are so frequently

encountered, such a course is apt to produce great hardship. The surgeon has learned that his cases of ulcer heal more quickly when the patient is confined to his bed and the limb is elevated; but in a large number of moderate cases of varix, uncomplicated by ulcer, exercise is of distinct benefit. Exercise should be conducted very carefully, and must be regulated so that all the sets of muscles may in turn be brought into play. Standing in one position for long periods is injurious, because the muscular strain is thrown upon the same vessels. Horseback riding is not generally good, as the return circulation is retarded by the pressure of the saddle. Sistach (65) found in the examination of French soldiers that varices were less numerous in the troops on foot than in those on horseback.

Let us now revert to the three clinical classifications and consider their significance from the stand-point of operative interference. The first class included those cases in which the limb was notably enlarged and in which symptoms were prominent, especially œdema. In such limbs, varix of the superficial veins is not general but is confined to those localities which mark the anastomosing veins between the superficial and the deep systems. Legs of this character are prone to skin changes and ulceration. The subjective symptoms, which we have learned to associate with the disease, are wholly out of keeping with the amount of superficial varix present and the patient is a true sufferer. This class of varix is the most persistent and stubborn with which we have to deal, for it points to an involvement of the deep veins. Operative procedures on the superficial varicosities are worse than useless, unless thin-walled sacculations are present which threaten to break down. Rest in bed, with elevation, and treatment of the skin lesions, are the only resources at our command. A well-applied muslin roller or an elastic stocking gives great relief. It is the belief of some surgeons that any case of varix which is relieved by mechanical support will be benefitted by operation. The falsity of such a doctrine is apparent.

Our second classification includes those cases in which there is no apparent extensive involvement of the deep veins and in which the Trendelenburg test is present. Our successes in operative interference belong to this class, if the operation is attempted with certain ends in view. The very multiplicity of operative methods is a good indication of the unsatisfactory results which most of them give. An absolute cure of varix is, at all times, an impossibility. All that we can hope to do is to transform veins of high tension to those of low tension; or, in other words, do away with the bad effects produced by venous incompetency.

In our third class of clinical cases are placed those in which isolated patches of the disease occur, but in which the Trendelenburg test is absent. In such conditions the internal saphenous vein may be unaffected and the valves still competent. More often, however, the vein shows evidence of disease, but nature has effected the so-called radical cure by an obliterative phlebitis. Yet I have several times seen total excision performed in such cases and in one instance high ligation with resection. In this third class relief can sometimes be afforded the patient by the excision of varicose packets, which by pressure may give rise to annoying symptoms. If such varicosities occur at the large anastomosing branches which join the superficial with the deep veins, it is probable that the deep system also is involved and operative interference is not indicated, excepting where rupture seems imminent.

Of the various operative procedures, the so-called method of Trendelenburg stands out most prominently for it is the only one in which a sufficient number of cases have been followed to establish thoroughly its claims. The operation, which Trendelenburg described, consisted simply of division between ligatures of the internal saphenous in the lower third of the thigh. This procedure was not original with Trendelenburg, for venous ligature was practiced by Everard Home (66) as early as 1799, and later in England by Annandale. Trendelenburg revived and popularized the operation, and by his test clearly fixed its indications and its limitations. The operation, as now generally practiced, is far different from Trendelenburg's description. It consists in resecting a variable length of the internal saphena well up toward the saphenous opening. The results are much better with this high opera-

tion, as there is less danger of the blood column being established by venous anastomosis; but it has led to confusion concerning the statistics, many of the authors having confounded the original procedure and the improved high operation. The following have followed cases for a variable length of time and have reported permanent results: Tobold, (67) 9 cases; Hippmann (68) 13; Charrade, (69) 13; Estienny, (70) 8; Cordebat, (71) 15; Prawdoluboff, (72) 12; Perthes, (73) 87; Faisst, (74) 15; Studsgaärd, (75) 8; Schelkly, (76) 10; Buhl, (77) 10; Zeller (78), 60; Goedecke, (79) 44; Goerlich (80) 69; Boecker, (81) 38; Kennedy, (82) 14; Miller, (83) 41. The number of successes from this operation are given by Zeller as 76 per cent; Perthes, 77 per cent; Faisst, 80 per cent, though his cases were treated largely by multiple excision; Goerlich, 84 per cent, and in his extensive review of the literature since 1892, he averages the successes at 75 per cent; Boecker, 56 per cent; Miller, 78 per cent.

Viannay (84) has pointed out the dangers of low ligation, the blood coursing through anastomosing channels; the presence sometimes of a double saphenous must also be remembered. Paul Delbet's (85) method of performing the operation is to be commended on account of its rapidity, neatness and simplicity. With the patient under local anæsthesia and having determined the path of the internal saphena, he pinches it up between the thumb and index finger, making a fold parallel to the axis of the limb and containing the skin, the fat and the vein. His assistant holds up the other end of the fold. He then passes a bistoury through the base of this fold and cuts upward, sectioning all structures, and without releasing the fold he places a Kocher hæmostat on each cut end of the vein. These ends are then pulled out and ligatures tied as deeply in as possible, and all the vein in front of them resected. In this manner a segment of vein of 5 or 6 cm. in length can be removed. Resection of the saphenous insures against regeneration of the vein, cases of which have been reported by Langenbeck, (86), Perthes, (87), Velpeau, (88), Grzes, (89), Ledderhose (90) and Miller (91).

The only other operative method which is at all established is the total extirpation of the internal saphena, sometimes called the operation of Madelung. (92) This, with various changes in technic, seems to be the operation of choice in this country; and an impetus has lately been given it by an ingenious instrument of Charles H. Mayo's (93) for facilitating the removal of the vein. Unfortunately, few cases have been followed, the only statistics with which I am familiar having been furnished by Boecker. (94) This author has performed the operation forty times with 88 per cent of successes. In talks which I have had with various surgeons, who have long practiced this method, the number of successes has been variously estimated from 60 to 70 per cent. The operation is more serious than that of high ligation and entails a longer rest in bed; furthermore, a careful consideration of the pathology of the disease does not seem to warrant its employment.

REFERENCES

1. Brodie, Sir B. C. Observations on the Treatment of Varicose Veins of the Legs. Med. Chir. Tr. Lond. 1815-16, vii, 195.
2. Wood, W. C. Brooklyn Medical Journal, Jan. 1896, 12.
3. Personal Communication from the Surgeon General, U. S. Army.
4. Sistach. Etudes Statistiques sur les varices et le varicocele. Gazette Medicale, 1863.
5. Miller, R. I. The results of operative treatment of Varicose Veins of the Leg by the methods of Trendelenburg and Schede. Johns Hopkins Med. Bull., Sept., 1906.
6. Gay, John. On Varicose Disease of the Lower Extremities and its allied disorders. Lond., 1868.
7. Broussais. Cours. de pathol. et de therap. generales. 1834, III, 312.
8. Richet. Traité prat. d'anat. medico-chirurgic. 1857. 155.
9. Berard and Denonvilliers. Compend de Chirurgie, vol. ii.
10. Bennett, W. H. Clinical Lectures on Varicose Veins. Lond., 1889.
11. Moreau, L. A. Contribution a l'etiologie des varices. Paris, 1877.
12. Trendelenburg. Beiträge zur klinischen Chirurgie, vii, 194.
13. Delbet, Pierre. Du rôle l'insuffisance valvulaire de la saphène interne dans les varices du membre inférieur. Semaine Med. Par., 1897, xvii, 372.
14. Albucasis. La Chirurgie d'Albucasis, traduite par le Dr. Lucien Leclerc., Par. 1861.
15. Briquet, P. Dissertation sur la phlébectasie ou dilatation des veines. Par., 1824.
16. Boyer. Traité des maladies Chirurgicales. Par., 1822.

17. Longet. Quoted by Gay.
18. Manley, T. N. Etiology of Varicose Veins. Clinical Recorder, 1896, i, 118.
19. deGuillejac, R. Nouvelle pathogenie des Varices. Presse Medicale, June 24, 1905.
20. Sistach. loc. cit.
21. Delaharpe, J. Quelques mots sur les causes probables des varices chez l'homme, Zurich, 1855.
22. Kretz. Untersuchungen uber die vena saph. magna beim menschen besonders rücksichtlich ihrer Klappen-verhältnisse. Archiv. f. Anat. und physiol. Anatomie., ii and iii, 57.
23. Kraemer. Munch Med. Woch., 1898, 1209.
24. Venot. Journ. de Medicine de Bordeaux. 1903, xxiii, 690.
25. Viannay. Note sur quelques points de l'anatomie de la veine saphène interne. Lyon Medicale, cii, 1170.
26. Gay, John. loc. cit.
27. Briquet. loc. cit.
28. Callender, G. W. In Holmes' System of Surgery, vol. iii, Lond. 1862.
29. Verneuil, A. Gazette Medicale de Paris, 1855, 524.
30. Quénu. Quoted by Delbet.
31. Broca. Des varices du membre inférieur. Bull. Soc. anat. de Paris., 1851, xxvi, 133.
32. Denuci. Quoted by Callender.
33. Verneuil. Loc. cit.
34. Dumay. Quoted by Callender.
35. Briquet. Loc. cit.
36. Sirus-Pirondi. Sur les varices profondes. Gazette Hebdomadaire, 1861, viii, 532.
37. Verneuil. Bull. de la Société anat. de Paris. 1855, xxx, 267.
38. Gross. Am. Jour. of the Med. Sciences, No. 84 New Series.
39. Bennett. Loc. cit.
40. Hughes, A. W. The Etiology of Varicose Veins with Notes of Dissections. Brit. Med. Jour., 1887, ii, 122.
41. Walsh, J. J. Varicose Veins, Univ. Med. Magazine, 1896, viii, 272.
42. Gay. Loc. cit.
43. Budin. Thesé d' Aggrègation, Paris, 1895.
44. von Lesser, L. Über Varicen. Virchow's Archiv., ci, 1886.
45. Paré, Ambroise. Oeuvres Compl. (Malgaigne) ii, 268.
46. Bennett, W. H. Loc. cit.
47. Manley, T. N. Loc. cit.
48. Briquet. Loc. cit.
49. Schwartz. Varices in article on Veins. Nouv. Dict. de med. et chir. prat., 1885.
50. Cornil. Sur l'anatomie pathologique des veines variqueues, Archiv. phys. norm. et path. 1872, iv, 602.
51. Agnew. Quoted by Walsh.
52. Soboroff. Virchow's Archiv. 1872, liv, 137.
53. Pilliet, A. H. Note sur la structure de la paroi des veines variqueues. Compt. rend. Heb. soc. de Biologie. March 5, 1897.
54. Epstein. Virchow's Archiv. 1887, cviii.
55. Broca, A. Études cliniques sur la Phlèbite variqueuse. Rev. de Chirurgie. 1889, ix.
56. Hodara, Menahem. L'histologie des varices. Jour. d. mal. Cutan. et Syph., Paris, 1895, vii, 65-129.
57. Bennett, W. H. Varix, its Cause and Treatment with especial reference to Thrombosis. Lancet. 1898, ii, 969.
58. Freer, E. L. Putties and Varix in the Army. Brit. Med. Jour. 1902, ii, 1807.
59. Gay. Loc. cit.
60. Sistach. Loc. cit.
61. Herapath. Gazette Medicale, 1849, 33.
62. Trendelenburg. Loc. cit.
63. Delbet, Pierre. Loc. cit.
64. Krehl. Clinical Pathology (Hewlett).
65. Sistach. Loc. cit.
66. Home, E. Obs. on Varicose Veins. Lond., 1801.
67. Tobold, B. Über Varicen der unteren Extremität und ihre Behandlung. Bönn, 1889.
68. Hippmann. Thése de Greifswald. 1894.
69. Charrade, J. E. De la ligature et de la resection de la vene saphène interne dans ler traitement des varices. Paris, 1892.
70. Estienny. Thèse de Toulouse, 1893.
71. Cordebat. Thèse de Paris. 1893.
72. Prawdoluboff. Bolnitschnaja Gazeta, Boskina. 1892.
73. Perthes. Deutsche Med. Woch., 1895.
74. Faisst. Beit. zur Klin. Chir., 1895.
75. Studsgaärd. Hospitalstidende, Copenhagen. 1895, No. 32.
76. Schelkly. Webenschappelyte Bladen. 1895, No. 3.
77. Buhl. Thèse de Berlin, 1896.
78. Zeller. Wurzbourg medic. Correspondanzblatt, 1898.
79. Goedecke. Thèse de Gottingue, 1902.
80. Goerlich. Beit. zur Klin. Chir., xliv, 278.
81. Boecker. Munch. Med. Wochenschrift. 1903, 885.
82. Kennedy. Glasgow Medical Journal. 1903, 59.
83. Miller. Loc. cit.
84. Viannay. Etude critique sur l'operation de Trendelenburg. Rev. de Chir., xxxi, 78.
85. Delbet, Paul. Rev. de Thérapeutique Medico-Chirurgicale. 1904, 78.
86. Langenbeck. Verhand. der Deutschen Gesellschaft für Chirurgie. 1884.
87. Perthes. Loc. cit.
88. Velpeau. Bull. de la soc. de chir. de Paris. 1862, iii, 137.
89. Grzes. Beiträge zur klinischen Chirurgie xxviii, 507.
90. Ledderhose. Deutsche Zeitschrift für Chirurgie. lxxi, 421.
91. Miller. Loc. cit.
92. Madelung. Verhand. der Deut. Gesell. für Chir. 1884, 114.
93. Mayo, C. H. St. Paul Medical Journal Sept., 1904.
Surgery, Gynecology and Obstetrics, April, 1906.
94. Boecker. Loc. cit.

THE SEQUENCE OF THE PATHOLOGICAL CHANGES IN APPENDICEAL PERITONITIS[1]

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That in appendiceal peritonitis, as in all other acute inflammatory processes, we have to do with a complex sequence of changes, in which the essential characteristics of the pathological picture vary from day to day, during the course of the disease, has long been a well-known fact; while in recent years, the clinical experience of Ochsner, and many others, has overwhelmingly demonstrated that, under favorable conditions of treatment, the vast majority of even the severer cases of peritoneal infection run a quite definite clinical course, characterized by the rapid subsidence of the peritoneal symptoms, and ending either in the ultimate resolution of the inflammatory process, or in the formation of localized peri-appendiceal abscesses.

During the past two and a half years, the writer had the opportunity to observe, both clinically and at operation, a relatively large series of cases of appendicitis, the great majority of which had, previous to the time of operation, been treated under approximately uniform conditions. The clinical course of the disease in all of those cases not immediately operated, was such as to leave no doubt but that we were dealing with a relatively uniform sequence of pathological changes, and the entire series has been studied with the idea in view of tracing, as far as possible, the sequence of these pathological changes.

Such a study of the pathological history of appendiceal peritonitis resolves itself into a study of the progress of the processes of inflammation and repair as they occur in this disease, and a knowledge concerning the progress of these processes can best be obtained by a combined clinical and pathological study of a sufficiently large series of cases, tabulating the pathological findings according to the time which has elapsed between the onset of the infection, and the observation of the pathological conditions. The essential features of the lesions, as observed at operation during each of the succeeding periods following the onset of the infection, were, in this series of cases, of a remarkably uniform character, and the fact that the features prominent at one period were found to be either increased or diminished in preceding or in subsequent periods has made it possible to trace, in a quite satisfactory manner, the course of the processes of inflammation and repair as they occurred under the conditions obtaining in these cases.

It is the object of this paper to outline this sequence of the pathological changes in so far as it has been possible for the writer to trace them by this method of study. The following statements are based upon a study of the condition of the peritoneum as observed at operation in 162 cases of acute, and 331 interval and chronic cases of appendicitis operated at St. Mary's Hospital and on Dr. A. J. Ochsner's[1] service at the Augustana Hospital, Chicago, during my service as pathologist and interne in these institutions; together with 41 cases of appendicitis which have been operated by Dr. McMullen and myself at the Ellis Hospital, Schenectady, since July 15th, last. As a control series, I have made use of my previously reported study[2] of the operative findings in 485 cases operated at the Albany Hospital during the six years previous to 1905; making in all 1,019 cases studied with reference to the pathological course of the intraperitoneal changes in this disease.

As a rule, but little difficulty was experienced in determining, approximately at least, the time of onset of the peritoneal infection, for in the majority of the cases peritoneal symptoms became well marked during the first thirty-six hours of the attack, and in those cases a clinical history of an acute exacerbation of peritoneal symptoms, occurring some time after the onset of the attack, ample evidence was usually found of the engrafting of a newer upon an older lesion.

The uniformity in the pathological findings from day to day in the Chicago and Schenectady cases must, in part, be ascribed to the fact that in all those cases not immediately operated, every effort was made to limit the further spread of the infection by peristalsis, for in those cases in which this line of treatment[3] was carried out, there was never any evidence of the engrafting of an acute

[1] The writer wishes to acknowledge his indebtedness to Dr. A. J. Ochsner and the Visiting Surgeons of St. Mary's Hospital for the opportunities offered to carry out this study.

[2] Stanton, E. Mac D., The Sequence of the Pathological Changes in Appendicitis. [illegible]

[3] The line of treatment carried out in those cases not immediately operated can best be illustrated by citing the routine orders governing their management, which were as follows:

1. Nothing by mouth (This order was absolute, and prohibited even sips of water).
2. Gastric lavage if patient vomited after entering hospital.
3. Nutrient enemas. (These enemas usually consisted of normal salt, ozii–vi, with liquid peptonoids, oz. i, and deodorized tincture of opium m. xv, and were given every four hours. The deodorized tincture of opium was omitted as soon as the pain had subsided, and more recently, in the Schenectady cases, the liquid peptonoids have been en-

[1] Read before the Annual Meeting of the Medical Society of the State of New York, Albany, Jan. 28, 1908.

diffuse upon an older, more localized lesion,[4] while in the relatively few cases in which food and cathartics had been given by mouth previous to the patient's entrance to the hospital, this condition was repeatedly encountered; the character of the newer lesion corresponding in time to the clinical history of an acute exacerbation of the symptoms which had in nearly every instance followed directly upon the giving of a cathartic or an increase in the patient's diet. The sequence of changes as observed in this study was so uniform that the writer believes the following statements to represent accurately the course of events in the vast majority of cases in which the peritoneal surfaces are kept at rest by appropriate methods of treatment; but there is every reason to believe that active peristaltic movements, however produced, tend to complicate the lesion, not only by actively spreading the infection, but by interfering with the process of repair.

In a study of this kind, cases of appendiceal peritonitis can be divided into two quite sharply defined groups: *First*, those cases in which the primary intraperitoneal exudate is essentially fibrinous in nature, and thus a dry exudate, and, *Second*, those cases in which the intraperitoneal exudate is from the first, or almost from the first, of a serous or sero-purulent type, and thus essentially of a fluid nature.[5]

In the group of cases not primarily accompanied by fluid outside of the appendix, there was usually present a more or less extensive dry fibrinous or fibrino-purulent periappendiceal exudate, forming adhesions between the appendix and the surrounding viscera, chiefly the omentum, but also commonly involving, to a greater or less extent, the lower end of the caecum, the parietal peritoneum in this region, and often one or more loops of the small intestine. Such adhesions, if their formation and stability be not interfered with by mechanical means, serve to limit the spread of the infection from the appendix, even though suppuration should later occur in its immediate vicinity. Evidences of the organization of this fibrinous exudate were first noticed on the third day, and this process of organization was well advanced by the fourth or fifth day, highly vascular granulation tissue having by this time largely replaced the primary exudate. Coincident with the beginning organization, there was usually also evidence of a rapid absorption of the exudate, so that, in the absence of continued or repeated infection, it is believed that this type of lesion rarely results in the formation of extensive, permanent organized adhesions.

In a certain percentage of this class of cases, the character of the infection from the appendix was of such a nature as to lead to the later formation of a fluid, purulent exudate in the immediate vicinity of the appendix, which exudate was from the first limited by the fibrinous adhesions. Under these circumstances, the wall of the pus cavity is formed, during the first three or four days, by soft, very easily ruptured fibrinous adhesions. As in the cases without free pus, organization of these fibrinous adhesions was first noticed on the third day, and the fibrin was very rapidly replaced by the granulation tissue, so that by the sixth or seventh days, true abscess cavities were encountered, surrounded by the usual granulation tissue. Clinically, when these cases were treated with the idea in view of limiting, as far as possible, mechanical factors which might interfere with the stability of the adhesions, there was never any evidence of a marked tendency for this type of lesion to spread beyond its early limits.

In sharp contrast to the class of cases described above, is the second group in which from the first, or almost from the first, the dominating intraperitoneal exudate is fluid in character, with, during the first few days of the attack, little evidence of a localization of the area of inflammation. It is this group which comprises the cases having a clinical history of early diffuse peritonitis, often of an alarming character, and yet, even in these cases, there can be no doubt but that every tendency of the inflammatory process itself, is toward the localization of the lesion: for it was in these very cases, provided only that disturbing mechanical factors were eliminated, that we encountered a most definite and uniform process of localization of the inflammatory area

[illegible] omitted the enema entirely [illegible] immediate operation added when necessary.)

4. The head of the bed was elevated at least twelve inches, and the patient inclined toward the right side by means of pillows.

5. A large moist boric dressing to abdomen, or a large cotton dressing. (The boric dressing seems at times to add to the patient's comfort, but the dressings, of whatever kind, are used chiefly because their presence tends to keep the patient more quiet in bed, and at the same time they largely overcome the temptation to make frequent and meddlesome physical examinations.)

6. Morphine hypodermically if patient was restless or in pain. (This was seldom necessary, except during the first night following admission to the hospital.)

7. Soap-suds enemas, beginning after about the fourth day and repeated, as a rule, every morning subsequently.

[4] In the 101 acute cases dealt with in this series there were but 3 deaths or 1.57 per cent.

[5] The character of this primary exudate may depend largely upon the extent of the destructive lesion in the appendix itself, but fluid exudates frequently occur without gangrene or actual perforation, and cases have been observed with extensive gangrene which must have existed for several days, without the presence of peiappendiceal pus, showing that other factors, such as the resistance of the patient, peristaltic movements, and the virulence of the infecting organisms must play an important part in determining the character of the lesion during the early stages of the inflammation. Instead of finding gangrenous and perforated appendices, associated with an extensive and severe periappendiceal peritonitis, it is the rule in the above mentioned clinics to find very limited peritoneal involvement, in spite of the most extensive destructive lesions of the appendix itself, in all of those cases referred by physicians who have from the first directed their treatment toward the prevention of the mechanical spread of the infection.

as shown by both the clinical course of the disease and the pathological findings.

This class of cases presented such a striking uniformity in the essential characteristics of the intraperitoneal lesions, as they were encountered at operation, during each of the succeeding periods following the onset of the infection, that the pathological conditions will first be described as they have been encountered during each of these periods.

In cases operated during the first day, the intraperitoneal exudate was of a serous or sero-purulent type. Fibrinous limiting adhesions were not present to a noteworthy extent, or were present only in the immediate vicinity of the appendix, which was often more or less completely surrounded by lightly adherent omentum. Beyond a more or less intense congestion of the blood vessels of the peritoneum, there was little, if any, noteworthy alteration of the serous surfaces themselves.

In cases operated during the second day, the intraperitoneal exudate was usually of considerable extent, and of a distinctly sero-purulent or purulent character. The absence of well-defined limiting adhesions was still noticeable, and the diffuse character of the lesion, in sharp contrast to the definitely circumscribed periappendiceal abscesses seen at a later period. The peritoneal surfaces already showed more or less loss of lustre, with here and there adherent flakes of fibrin, but they did not, as yet, show the marked roughening seen after the beginning of organization of the third and fourth days.

In cases operated during the third day, the intraperitoneal exudate was of a distinctly purulent character. The gross changes in the involved peritoneum, especially in the immediate neighborhood of the appendix, were now very noticeable, due in part to the more abundant fibrin, and in part to the changes in the peritoneum incident to the beginning organization, which seems in all cases first to become noticeable on the third day following the involvement of any given area of peritoneum. Limiting adhesions were now fairly well developed in most instances, but the lesions were, as yet, of a decidedly diffuse character, the area involved being much more extensive than at a later period; and there was as yet little or no evidence of the formation of sharply defined abscess cavities. It was at this time that the pus was encountered, extending irregularly between the various structures lying within the area of peritoneum involved.

By the fourth or fifth days the process of organization was well established, the previously existing fibrinous adhesions becoming replaced by organizing granulation tissue, which was also noticeable over the surfaces of the peritoneum in direct contact with the purulent fluid exudate. This granulation tissue serves to encapsulate the pus, and it was from this time on that the formation of definitely defined abscess cavities was observed, they being at first usually more or less multilocular, but later becoming more localized to form, usually one well-defined cavity. The first evidences of the formation of a true abscess cavity were observed on the fifth or sixth days following the onset of the infection, although it was not until the seventh or eighth days that the cavities became sharply defined with limiting adhesions firm enough to permit such manipulations as the packing away of the non-involved intestines, without great danger of accidentally opening the abscess at some undesired point.

The number of cases accompanied by pus outside of the appendix showed practically no increase after the third day, and, except in those cases giving a clinical history of a later acute exacerbation of peritoneal symptoms, there was no evidence of an increase in the area of peritoneum involved after this time. On the contrary, after the process of organization was well established, on the fourth or fifth days, there was every evidence of a progressive diminution in the extent of the peritoneal involvement, which became less extensive as the abscess cavity became sharply localized, and limited by the organizing adhesions.

This phase of the repair process which results in the more or less complete resolution of the peritoneal lesion beyond the immediate wall of the abscess was well shown in a number of cases coming to operation on the tenth and eleventh days, the clinical picture in each having been on admission that of a severe diffuse peritonitis. In these cases, the abscess cavities were surrounded by a narrow zone of organizing adhesions, while the peritoneum of the ascending colon and nearby loops of small intestine beyond the wall of the abscess cavity, although non-adherent, was thickened, reddish, and distinctly granular, without fibrin or other evidences of an acute lesion. The clinical picture was, on the third and fourth days, undoubtedly that of a diffuse peritonitis, and this view was confirmed by the pathological findings, as observed later at operation, although by the tenth or eleventh days the diffuse lesion had so far cleared up as to leave but slight, though unmistakable, evidences of its having existed.

After the tenth day the adhesions were found to be increasingly firm and of a highly vascular type, thus often increasing the difficulties of operative work to a considerable extent. It is also about

this time, or a little later, that one begins to encounter secondary fistulous openings into the intestine, and the other complications caused by the tendency of the pus to seek avenues of exit of its own.[9]

As practically all cases accompanied by abscess formation were operated before the close of the second week, it has been impossible, in this study, to trace the further progress of this class of cases when not operated; but, judging from the histories and the pathological evidences still persisting in many of the chronic and interval cases, the ultimate resolution, without operative interference, of even this type of lesion is of more frequent occurence than is generally supposed.

Tracing this sequence of changes from a purely pathological viewpoint, we find three stages of the disease, corresponding in clinical experience to periods showing wide differences in operative mortality. During the first stage, we find that when the peritoneal lesions exist at all, they are, as yet, not associated with marked alterations of the peritoneum itself, the lesions being of such a type as to require, if at all, only temporary drainage. After the full development of the peritoneal infection, on, as a rule, the second or third day of the attack, and until the diffuse lesion subsides or becomes a localized abscess on about the eighth day, we find the intraperitoneal conditions of such a nature that removal of the appendix is, of itself, by no means curative, at least as regards the peritoneal infection, while this dominating peritoneal infection is essentially of a diffuse character, at best difficult and often impossible to drain efficiently, and but doubtfully benefitted by operation. On the other hand, by the eighth or ninth days the peritoneal lesion in the milder cases has already largely disappeared, while in the more severe pus cases the condition encountered, no matter how great the quantity of pus may be, is essentially an abscess cavity, the drainage of which is a simple and satisfactory surgical procedure.

There can be no doubt of the advisability of operative interference previous to the time of the development of the peritoneal infection, nor is there any doubt of the satisfactory results and low mortality of operative work in the stage of localized abscess formation. The high mortality of operative interference between these two periods is known to all, and the clinical results of Ochsner and many others now overwhelmingly demonstrate that, with proper methods of treatment, the vast majority of cases seen first during the stage of the diffuse lesion can be carried over for operation at a later, more favorable period. The almost absolute uniformity in the progress of those processes leading up to the localization or resolution of the peritoneal inflammation, as it was observed in this study, has served to convince the writer that the claims of those advocating conservative treatment during certain stages of acute appendicitis are founded upon a much more definite pathological basis than is generally recognized by the profession at large.

In conclusion, the writer wishes to emphasize the fact that the distribution of an intraperitoneal infection is, for the most past, dependent upon purely mechanical factors, and that in the absence of peristaltic movements, such as are produced by giving food or cathartics by mouth, the tendency of a localized peritonitis, even of appendiceal origin, to spread beyond its original boundaries is very slight indeed, while, when a condition of peritoneal rest is once obtained, the vast majority of cases of extensive and severe appendiceal peritonitis show a rapid localization of the inflammatory process, which either subsides entirely or ends in the formation of a localized abscess.

[9] As a matter of fact, this class of complications was [illegible] in this series of cases, and this statement is based on a partial study of the cases reported in the literature dealing with this phase of the subject

BREECH PRESENTATIONS: AN ANALYSIS OF 250 CASES OCCURRING AT THE BOSTON LYING-IN HOSPITAL[1]

By ROBERT L. DeNORMANDIE, M. D., Boston, Massachusetts

THE material for this paper is 250 cases of breech deliveries which have occurred at the Boston Lying-in Hospital from August 1, 1887, to November 14, 1907. Breeches occurring in multiple pregnancies, in premature cases and in macerated fœtuses I have eliminated, for statistics with these included are of no value.

There were 143 cases in primiparæ, 57.2 per cent — a much larger proportion than we are led to believe from the text-books. The following table gives an analysis of the positions found.

Position.		Footlings.	Double Footlings.
S. D. P.	27	9	2
S. D. A.	49	8	4
S. L. P.	35	6	4
S. L. A.	73	15	6

No record of 12 cases.

These figures on the relative frequency of the positions differ considerably from the accepted ones. Edgar, in his "Practice of Obstetrics," quotes Naegele as finding sacrum left anterior in 120 out of 163 breech presentations, 40 being sacrum right posterior. In other words, he says the breech practically always engages in the left oblique diameter. Edgar apparently agrees with Naegele, for he adds that sacrum, right anterior and left posterior are rare. Reynolds and Newell, and Williams, on the other hand, say the two latter are the commonest, i.e., the breech engages in the right oblique diameter. It is clear from the cases in this series that there is no such preponderance of one diameter over the other. Sacrum left anterior is the most common, but sacrum right anterior and left posterior are by no means rare.

Ether was given in 108 cases; and in 111 the patients delivered themselves. By "delivered themselves" I mean that there was no traction applied or practically none: the baby simply being carried upwards in the curve of Carus prolonged. In all cases an assistant was present to give intelligent suprapubic pressure. Twenty-three times the delivery was slightly aided at the end, and in 4 cases no mention of what occurred is recorded. In 112 cases manual extraction was resorted to. In a great majority of cases the records failed to show the exact cause for operating and, therefore, no attempt has been made to tabulate the causes of extraction. The methods used were: by foot and leg, 90; by finger in groin, 10; by blunt hook, 2; by forceps to breech and fillet, 1. Forceps to the breech was twice attempted, but both times failed. Forceps to the aftercoming head was applied 14 times, and of these cases, 9 babies were born alive and went out of the hospital well; 5 were lost. Five times forceps was attempted but failed. Three babies were finally extracted manually alive and one dead; and on one a craniotomy was necessary. In these cases of manual extraction there was no extension of the arms in 58; both were extended in 32; one only in 5; and in 5 there was a posterior displacement of the arm. The deaths which occurred in the manual extraction cases, I shall take up in a moment from a different point of view, as some were in no possible way due to the fact that an extraction was performed.

Extensive laceration of the maternal soft parts is noted as one of the increased dangers to the mother in breech presentations. In this series, the perinæum was found intact 36 times; slight tear, 62, moderate, 35, and no fresh tears in 50, a total of 192 cases, where obviously there was no marked increased risk over vertex presentations. In 11 there was no record of the condition of the perinæum. In 27 there were bad tears; and 11 in which the tear extended to the sphincter. In 9 there were complete tears through the sphincter. There is no question but that occasionally the tears may be extensive and this fact should be recognized in any prognosis that is given. In

[1] Read in part before the Obstetrical Society of Boston, December 17, 1907.

the complete tears all but two had entire control of both gas and fæces on leaving the hospital. One had control of fæces but not of gas; and one had a small recto-vaginal fistula.

I did not find the temperature charts of nearly 20 of the early cases, and in the remaining cases there were 10 cases of sepsis. None was fatal, none was severe; all were discharged well. Eight showed uterine sepsis and the infection was readily controlled by intra-uterine douches. Two of these cases were probably gonorrhœal. In 2 the perinæum was infected and the stitches were removed. There were 4 cases of phlebitis in three patients: one, a very slight pelvic affair which cleared up in 4 days; the second followed a septic case, first the left leg and then the right was involved; the fourth case was left-sided in a case of antepartum bleeding of some days duration; this cleared up entirely in 9 days.

There were 2 cases of placenta prævia; in one the mother died, the only maternal death in the series and can in no way be laid to the breech presentation. She was sent to the hospital with a pulse of 132, blanched, and in very poor condition. The baby was dead before operation was undertaken. In the second case the mother made a good convalescence, but the baby was sacrificed by a slow manual extraction, not recovering from the pallid asphyxia.

Postpartum hæmorrhage occurred 10 times, once from the cervix, the rest from the uterus. Twice the uterus and vagina were packed, but in the other cases less radical means controlled the bleeding. No cases died and no sepsis followed.

I have already spoken of the extension of the arms in the manual extractions. In the whole series the figures are: no extension, 164; both extended, 51; one extended, 12; no record, 23. It is clear from these figures that extension of the arms is much more common in extraction cases, as is well recognized, and, that further, when one arm is found to be up, in a great majority of cases the second is also extended. In no case did the chin rotate to the symphysis.

There were 5 fractures of the femur; 4 occurred during manual extraction; 2 when extraction was done by traction on the foot and leg; and 2 when a finger in the groin was the method used. There was one fracture where there was no extraction. The humerus was fractured twice, both in manual extraction cases, and in both the arm was extended, and once it was displaced posteriorly. Four clavicles were broken: all where the arms were extended and where an extraction was done. There was also one separation of the lower epiphysis of the femur; and one separation of the dorsal vertebræ from excessively hard traction on the trunk. Obstetrical paralysis was found 6 times, all but one of which were in cases where the arm was extended.

Craniotomy was done twice, both times in contracted pelves. Hydramnios was present only twice, and a contraction ring was noted but 5 times. Asphyxia pallida occurred 23 times, and death of the baby followed in 10, showing how serious a condition it is. Hæmatoma of the sternomastoid muscle was seen but once, and was right-sided. Hæmorrhage of the new-born was present 3 times, was fatal once; and there was one fatal hæmorrhage from the umbilical stump.

There were 25 cases where the cord prolapsed, and of these 25, twenty were footling presentations. In none was any attempt made to replace the cord. In all, manual extraction was done at once. Eight of these babies died. An examination into the causes shows that one had congenital syphilis; two were malformed; on one a craniotomy was done because of a contracted pelvis. In another case, death occurred where the patient came to the hospital after 3 days of indifferent labor, with the cord prolapsed and feebly pulsating. Immediate operation was of no avail. In another case, death was due to poor judgment. The patient was having poor pains, and she was given chloral. She slept during the night, and in the morning a non-pulsating cord was found in the vagina. Eliminating these 6 deaths, there are 2 cases left in which the loss of the baby was due directly to the prolapse of the cord. As prolapsed cord is regarded by Williams "one of the most frequent causes of fœtal deaths," it seems to me the results were most excellent; and the reason for such good results is because operation, manual extraction, was done at once.

An analysis of the length of labor of these

cases shows that there were 70 cases where the patients delivered themselves, in which the combined first and second stages was under twelve hours; while over twelve hours there were 41 cases. There were 99 cases where the first stage was twelve hours or more; and in 59 of these cases manual extraction followed, leaving 40 who delivered themselves; and of these 40 cases, in 31 the second stage was under one hour. The second stage was prolonged to two or more hours in but 24 cases; and 10 of these delivered themselves without aid, and 2 deaths resulted. Manual extraction was deemed necessary in the remaining 14 of these 24 cases, and 3 deaths followed.

These figures are instructive, but those in regard to the time of rupture of the membranes are the most striking and important. There were 95 cases where the membranes ruptured within two hours of full dilatation; and of these, 55 delivered themselves, and 4 deaths occurred. Manual extraction followed 40 times, and 6 deaths resulted. In marked contrast to these figures when the membranes ruptured close to full dilatation, are those when rupture took place early in labor or before labor started. There were 21 cases where the membranes had ruptured 12 hours or more before full dilatation. Only four of these patients delivered themselves, and in one of these the baby was still-born. Manual extraction was necessary in the remaining 17 cases, and in these 11 deaths occurred.

The mere length of labor is not the important point to be considered, for there were many long labors where delivery was successfully accomplished. The point that stands out clearly is, that when the membranes rupture early before the onset of labor, or more than 12 hours before full dilatation, manual extraction was very common, and the death of the baby was very probable.

In all of the 250 cases there were 46 deaths of babies. It is not, however, fair to include in the mortality list cases clearly not due to the breech presentation. The following 19 cases I have excluded: 7 malformations, 4 cases of antepartum bleeding, one each of hæmorrhage of the new-born, hæmorrhage from the umbilical stump, congenital syphilis and cerebrospinal meningitis, and 2 cases of contracted pelvis where a craniotomy had to be done. There were 2 cases in which death was due to the breech: but from the history it does not seem best to include them in the total deaths. The one was the patient I have already mentioned, who came to the hospital with cord prolapsed. The other had been looked after by a midwife and a physician for 3 days. She finally was sent into the hospital and it was found that the baby was dead, the breech was impacted at the brim, and above was a very tight constriction ring. She was finally delivered and made a good convalescence.

Eliminating these 19 cases, the deaths due directly to the presentation were 27; 19 were in primiparæ and 8 in multiparæ. A further analysis of these 27 cases shows, that in 11 cases the duration of labor was from 16 hours up to 2½ days. In all of these 11, the membranes had ruptured early, some 3 and 4 days before the onset of labor. The shortest time was 7½ hours before full dilatation. Of these 11, manual extraction was necessary in 9, only 2 patients delivering themselves. Six of these cases showed some marked alteration in the fœtal heart sounds before operation was undertaken. In 3 the fœtal heart was not watched carefully, and in 2 no alteration took place.

There were 6 cases where the patients delivered themselves unaided; and from the records it would seem that the fœtal heart was not watched as carefully as it should be.

Two deaths were due to prolapsed cords; one was in a primipara with a large 10½ pound baby; the other was a small baby in a primipara with an external conjugate of 17.5 cm. There were 3 cases of labor of short duration, where the breech was expelled without assistance and the cord then was found pulseless. Ether was given and extraction was at once done, but without avail.

There were 3 cases where the pelvis was contracted; and all were lost. In another the baby was manually extracted, the posterior arm was locked behind the occiput and the humerus was fractured. The baby did well until the fourteenth day when, after the examination of the fracture, it suddenly collapsed and died,— probably, the record states, of fat embolism. The final case, where the death

of the baby occurred, was brought into the hospital because her room was so small and filthy that operation there was deemed dangerous. The second stage, with ruptured membranes, was thereby prolonged to 4 hours. She was delivered at once upon arrival at the hospital, but the child lived only a few moments.

CONCLUSIONS

1. Breeches in primiparæ are common.

2. Manual extraction occurs in one-half of all breech deliveries.

3 Forceps to the after-coming head is at times a life-saving procedure.

4. Lacerations of the maternal soft parts occasionally are very extensive.

5. Injuries to the child are much more common than in vertex deliveries.

6. Sepsis is no more common in breech than in vertex deliveries.

7. Breech presentations in contracted pelves should have an early Cæsarean Section.

8. The fœtal heart in breech presentations should be listened to at short intervals after the rupture of the membranes.

9. If the cord prolapses, immediate extraction should be done.

10. A long labor, *per se*, is not an indication for operative interference.

11. Early rupture of the membranes, without advance in the labor, is an indication for immediate operative interference.

It is these last two conclusions upon which I wish to lay especial emphasis. A long labor where the advance is steady, with the membranes intact until a short time before full dilatation, is not an indication for operative interference. I have shown that the deaths in such cases are relatively few; but in marked contrast stand out the cases where the membranes rupture early or before labor starts. When a series of 21 cases with the membranes rupturing early in labor give a mortality of 12, then is it time to see wherein lies the error of our management of the cases.

We are advised in the text-books to leave breeches alone until a positive indication arises, and that indication is usually said to be an alteration in the fœtal heart. If we wait until this occurs, then we must of necessity operate on a baby with lowered vitality. It is not the manual extraction *per se* that kills, it is the fact that a hard operative delivery is done on an already partially asphyxiated baby. This series of cases, it seems to me, show that fact clearly; for in the prolapsed cord cases, where manual extraction was done at once, the results were exceptionally good; while where manual extraction was done late, after the membranes were long ruptured, the results were very bad.

It, therefore, seems fair from this series of cases to recast the indications for operative interference in breeches and not to wait until there is an alteration in the fœtal heart sounds, but to regard a non-advance or very slow advance of the labor, the positive indication for delivery.

DEPARTMENT OF TECHNIQUE

THE USE OF HARRINGTON'S SOLUTION IN THE TREATMENT OF SUPPURATIVE INFLAMMATIONS OF THE KNEE-JOINT

Report of an Illustrative Case

By J. E. SUMMERS, M. D., Omaha, Nebraska

It has been proven, experimentally and clinically, that Harrington's solution will kill all of the common germs met with in surgical practice in from twenty seconds up to one minute, and it does not kill the tissues, that is to say, it is not caustic. After thorough washing of the hands in hot soapsuds, and then immersing them for two minutes in Harrington's solution, if then cultures are taken there should be an entire absence of growths. Even when there is no preliminary washing of the hands before their immersion in the solution for two minutes, the results are remarkable. Harrington says: "I have repeatedly soaked my hands (without preliminary scrubbing) for two minutes, and then have had plantings made from material removed from about each nail and from scrapings of the skin of each finger, and from the palm. Occasionally, I got a growth, but as a rule, every tube of bouillon remained clear and sterile.

Now, first, if we have to deal with an infected wound, all of its surfaces permitting of being laid bare, so as to admit of the removal of the infective products and more or less destroyed tissues; second, if we have at hand a solution which will destroy the germs of infection, but not injuring the healthy tissues; and, if we, in addition, employ free drainage to the whole surface of the wound, the necessary result must be the changing of an infective, perhaps life-threatening, condition, to one representing a healthy process of repair.

Briefly in illustration, a Case. — A little boy, seven years of age, was brought to me, September 20, 1907, with the following history, furnished by his father: About August 15th, he had been struck upon the knee by a baseball; there was not much complaint at the time, but four or five days later he began to suffer severely, the joint began to swell and the child became very ill. The customary general and local treatment was employed. About September 6th, a physician made an incision into the joint, and evacuated much pus. Upon entrance into the hospital the child was in a serious state; he was thin, pale, expression anxious; his temperature was high and the pulse rate fast. The knee was flexed and there was a short incision on the inner side from which some pus was running; he was in mortal terror of being touched, and his condition was dangerous. Under ether, the knee was cleaned up and it was found that there was a large reservoir of pus in the upper part of the joint cavity, which the incision did not drain freely. The patella was loose in the joint — it was removed. An incision was made directly across into the joint, and the flexion increased to the limit so as to expose the interior freely. Considerable pus escaped, although the preliminary irrigation had appeared to remove all. In other words, the incision opened, as it should, not only the extensive synovial membrane freely, but also its pockets. With scissors and forceps much necrotic tissue was removed. Two high lateral incisions were added, so as to better drain the upper cavity of the joint, and the suprapatellar bursa, which freely connected with it. After thorough irrigation with hot normal salt solution, and dry sponging, the cavity of the joint was filled with Harrington's solution, and all exposed parts covered with gauze saturated with the solution. The gauze and solution were removed after four minutes, and all parts gently irrigated with sterile water, and dried. The wide open wound was packed tight with iodoform gauze. Heavy dressings were applied and bandages, so as to hold the leg in its forced flexed position.

Result. — The boy's general condition changed wonderfully. The pain disappeared, the pulse dropped, the temperature fell; he began to eat. For the first time the dressings were removed on tenth day; there *was no pus, not a drop*, in the joint; but it was filled with beautiful granulations. On the edges of the two high incisions, made to better drain the upper part of the joint, there was a little mild infection. The knee was straightened, and the wound repaired. The edges of the flaps were thick and the skin retracted so that nice, accurate co-aptation of the skin edge was impossible. The

second dressing was about one week later and showed absolutely no infection anywhere. The boy left the hospital after a stay of seven weeks; he walked around the ward two weeks before going home, wearing a posterior splint to prevent a tendency to flexion. The little fellow could flex the knee some, but could not extend it. I am hopeful that in time this will improve. Three days ago we learned that he was getting along nicely.

Harrington's solution acted in this case as I have never seen any other act in similar cases, although, of course, we recognize that the incision employed is the best for complete drainage of the knee joint, and drainage is the *sine qua non*.

Two weeks ago last Saturday I did a similar operation for a man suffering with chronic gonorrhœal inflammation of both knee joints. He had been under observation in the hospital for many months. Only one knee was operated upon. The dressing was first changed upon the thirteenth day, and the limb straightened. The wound was ideal in appearance, and I think the outlook good. I will report the case later.

My experience with Harrington's solution is not very great, but we use it in infective wounds where it is applicable. After thorough surgical cleansing of a wound or abscess cavity, the solution is allowed to remain in contact with all its surfaces for from two to five minutes; it is then irrigated or sponged away, and the particular wound dressed as required. Any one who will try Harrington's solution, as indicated, will like it. It has, besides its proven antiseptic property, the power, when applied to a raw surface, to produce a copious discharge of serum, thus aiding the washing away of obnoxious elements from a wound.

ARTHRODESIS AND TENDON TRANSFERENCE IN PARALYTIC CLUB FEET

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Synopsis — Paralytic club-foot a very prevalent disability. Recurrence of deformity slow, but certain, when ordinary methods only are used for correction. Great value of arthrodesis in improving strength and ability to support body-weight. Its value in flail ankle joints. Tendon transference a supplement to arthrodesis to restore muscular balance in member, and thus prevent return of deformity. Its wide range of application in cases hitherto considered hopeless. Early correction, fixation and proper balance desirable, that strength of muscles may be maintained and co-ordination restored by use, and valuable time thus saved. Better results in children than in adolescents, for several reasons; hence the plea for early operation. Arthrodesis in the younger cases still on trial. Author's personal experience: Satisfactory results in more than thirty cases without mishap.

Having been early in copying the work of the world's leading orthopedists in the treatment of paralytic club feet, your essayist has accumulated experience which may be of some value to those in the formative stage, or to those who do surgery of this character occasionally only, without having had any considerable orthopedic experience. No claim of originality is made, and due acknowledgment is extended to all who have followed Albert in doing arthrodesis, to improve the usefulness and sustaining power of paralyzed members, and to Nicoladini and others in tendon-grafting and tendon-transference, to appropriate to best advantage the remaining muscular power. Perhaps the greatest good to come from the rediscussion of subjects which are not original with a writer, is that it serves to disseminate our knowledge among our fellows and the great numbers of general practitioners who have the first observation of cases, and who are the court of first appeal, which frequently decides, for good or for ill, the course of the cases. Paralytic or acquired club feet is a most common deformity, and is attended with varying degrees of disability, and the majority of cases are amenable to a much larger measure of relief than is generally recognized, by either physicians, general surgeons, or even some orthopedists.

For many years the common practice was to correct the deformity in paralytic club foot, without any attempt to correct or overcome the tendency to return of the deformity, except by a brace, which is not only undesirable, but impracticable; because it is usually inefficient, or soon rendered so by wear, breakage, neglect, or the growth of the child. Return of the deformity was, of course, inevitable. The discouraging effects upon parents only served to resign them to the unfortunate condition. In general, the bad prognosis in these

conditions has served to pervade both lay and professional minds with a hopelessness that causes a large proportion to abandon treatment, or to seek the relief which a brace will afford, their advisers oftentimes having no conception that an operation might furnish a large measure of relief.

It is also unfortunate that so many years of lameness and disability are spent, to the detriment of the individual, in want of use, in favoring secondary deformity and lack of development. The early establishment of corrected conditions is most useful in securing growth, development, and the largest possible usefulness. The pernicious effects brought about by over-action of strong muscles, and the over-stretching of weak ones, serve to exaggerate the deformity, and, is indeed, solely responsible for it. The maintenance of a member in a normal position, by joint fixation, limits the action of the stronger muscles and protects the weaker, and the supplemental action of transferred muscular power serves to maintain a more balanced function. The early correction of the position, and the restored balance of muscular power, are desirable to hasten early use, and thus gain time, which is an important factor in the growth and development of weakened, though not wholly paralyzed muscles; and, if other muscles have been utilized, and their function transferred, their use and co-ordination should be established early, while the child has the adaptability peculiar to its age. A gain has thus been made which, in an older individual, would not be as fully realized. In some older cases there is disappointment, seemingly for no other reason than a lack of spirit. The older children and the adolescents who have not learned, or who have been deprived of walking, have a fear of falling, in their efforts to walk, which a young child does not possess, and, therefore, falls repeatedly without discouragement. These older children lose this "vis-a-tergo" if surgical relief comes too late. This applies to the extreme bilateral cases.

Tubby and Jones, in the preface to their admirable treatise on the Surgery of the Paralyses, say: "The newer procedure of muscle-grafting, tendon-transference, and arthrodesis, has widened the scope of surgical treatment, both of paralysis itself, and of its resulting deformities, and promise to effect an entire revolution in this branch of surgery."

In the very slight cases of toe-drop, the tibialis anticus, transferred to the common extensors, will do much to overcome the lack of action in the disabled extensors. This is both the simplest and the most common procedure. In cases of total loss of the whole anterior extensor group, from early paralysis, and where no brace has been worn, and a severe talipes equino varus has been produced in a child of some years, it will then be necessary to do much more — perhaps the complete removal of the astragalus, and the removal of the joint surfaces from the calcaneo-cuboid articulation, and the appropriation of the tibialis anticus for the extensors. In very extreme cases of varus, the tibialis anticus is secured to the periosteum, on the outer surface of the cuboid, and the tendon of the flexor longus hallucis, brought through the interosseous membrane, and attached to the common extensors. The operation most frequently required is the production of an artificial ankylosis of the tibio-astragaloid, astragalo-scaphoid, and the calcaneo-cuboid articulations, with such transfer of muscle power as available and necessary to overcome the tendency to return of deformity, and to lift the toes sufficiently to prevent dragging.

In bad cases of deformity, usually an evidence of extensive loss of muscle power, arthrodesis is positively indicated to fix the position that the foot may easily be maintained at a right angle. This serves to prevent the over-stretching of weak muscles, so destructive to their usefulness, and any appropriated muscles used do not suffer an immediate handicap; and even though their action may be relatively feeble, yet it may be enough to maintain fair function, balance muscular action, and maintain the position. Less often is it necessary to provide against loss of the posterior muscles of the leg. Calcaneus is a relatively rare form of deformity. It is caused by the loss of the strong calf muscles, and if this is the sole disability, our task is greater in securing muscular balance than if part only of the anterior group are paralyzed. The posterior tibial, peroneals, plantaris, and flexor longus hallucis have been used singly, or in various combinations, to meet the indications. And, if anterior muscles only are available, the tibialis anticus, extensor proprius hallucis, or a slip from the extensor longus digitorum may be appropriated to such an extent as to get a balanced action. A stiff ankle may be necessary to a more secure and complete result, and the displacement of the foot backwards, according to Whitman, is so valuable a measure that it should always be used. The degree of ankylosis (which is difficult to predict) should vary to suit the needs of the various cases. We should secure complete ankylosis in flail joints. In general, partial ankylosis only, in proportion to the amount of deformity, and the tendency thereto.

Wolenberg calls attention to the ill consequences of nerve division in muscle-splitting, and cautions

against severing the transverse nerve communications, which is likely, if the muscle is split above its middle.

Lorenz believes that it is time for a reaction in tendon-grafting; he having met with cases where it had been overdone, with results worse than before. There is undoubtedly this danger, and causes us to pause and give heed to the conservative words of Tubby, in his Hunterian Oration last year, wherein he states that he feels in attacking paralytic affections, either by tendon-grafting, muscle-transplantation, or nerve anastomosis, that we are confronted by a most intricate problem; but early results, following operative treatment, considering the comparative failure of all the preceding measures, seem to justify a very careful and well-considered trial in suitable cases.

At the Nebraska Orthopedic Hospital, since its opening in October, 1905, the writer has operated sixteen patients, representing twenty-one paralytic club feet, by arthrodesis and muscle-transference. The ages were from five to twenty-one years. In private practice, an almost equal number has been so treated, in a period somewhat longer. In no case was suppuration a factor. Drainage was always used, in the form of gauze, rubber tissue, or combined in the form of a cigarette, that blood, serum, or synovia might find ready egress. This was gradually removed at each daily dressing, until all drainage was dispensed with, within a week. The discharge of synovia would sometimes continue for from three to six weeks. One gave a slight discharge for three months. All closed without evidence of suppuration. In nine cases of extreme deformity, astragalectomy was done in addition to the arthrodesis and tendon-transference, and these represent some of the most pronounced improvements, in which crutches and braces have been discarded.

The writer being a surgeon, and a constant user of catgut, this material has practically superseded silk, which was early used in imitation of the orthopedist. The silk, I believe to be only necessary in tendon-lengthening, according to Lange, and to those cases where the tendon is united to bone, or periosteum, under tension, as in the transfer of the tibialis anticus to the outer border of the foot, and attached to the cuboid. Fine strong silk, boiled in sublimate, dried, and reboiled in paraffine (melting point 55 degrees) immediately before operation, as recommended by Lange, is an elegant suture, easily handled and free from the larger knots of the finest catgut suture, which must be admitted by all to be objectionable in the delicate work necessary, especially in young subjects. The skin was, at the first, united by silk, later horse-hair, and now, by plain catgut. The latter, used in the form of a continuous suture, is preferred.

Very heavy plaster casts have been applied, to permit of large openings for dressings and inspection. Swelling at the fenestra should be controlled by compresses and snug bandaging. The first casts usually remained on for six weeks, when they were renewed for cosmetic reasons. Light weight bearing was allowed after two months; slight use in walking in three months, and increased or diminished according to their ability to use, without pain, or evidence of arthritis. The patient should not be encouraged to use the foot, if any considerable pain is produced. Usually no pain or disability from arthritis persisted after four to six months.

This prolonged maintenance of the feet, in the corrected position, has worked wonders in producing a more normal shape to the feet, and with a fixed position there was opportunity for a more normal action of the sound muscles; and the weak ones were given a chance, they being aided by the transferred muscles, whose power has been subtracted from the strong group, and added to the weaker, thus equalizing the power, balance and function, and thus lessening and perhaps preventing recurrence.

It can be fairly stated that every case has been benefited in every way. The improvement has been somewhat commensurate with the strength and value of the material to be utilized in the restoration. Most of the cases are too recent for an ultimate estimate. Results promise well, however, and in general are among the most satisfactory in this class of surgical endeavor.

As a rule, arthrodesis is not recommended by experienced orthopedists in subjects under nine years; the best and most permanent results, from this part of the combined procedure under discussion, are in subjects above that age. The writer, however, felt impelled to treat his young subjects the same as the older ones, believing that the arthrodesis might better be repeated later, if necessary, to re-stiffen the joints, than to deprive them of its unquestioned benefits. This course has seemed justified in the poor cases in which the period of treatment and observation was limited, and braces were not available nor practicable, for a long period. Another explanation also is that the operative surgeon is more impatient for results, and is quicker to do definite things, than the exclusive orthopedist, who seems to have been educated in a school for patience and is willing to wait longer for results. We are, therefore, reminded of the lines of Pope:

"Avoid extremes, and shun the fault of such,
Who still are pleas'd too little or too much."

Conclusions: 1. Arthrodesis after resulting ankylosis, holds the ankle stiff and immobile. The increase of mobility in the anterior articulations of the foot will compensate for the loss of motion in the large articulations of the tarsus. The foot is thus permanently maintained in a right angle position. 2. If all of the muscles of the leg are paralyzed, resulting in a flail joint, the production of a stiff ankle and tarsus is the only practicable procedure, if a foot and ankle are to be made to sustain the body-weight. 3. Tendon transference, in addition to arthrodesis, appropriating to best advantage the remaining muscles, enables us to secure the best possible results. 4. Patients should have the benefit of such treatment as soon as the extent of the paralysis is determined. 5. Great advancement has taken place in this branch of surgery.

The profession generally is not fully apprised of this advance: attention to this subject, therefore, it is hoped, will serve to increase interest in this class of work. The improved prognosis will doubtless result in lessened deformities, increased usefulness, and a more hopeful outlook for those too frequently regarded as hopeless cripples, because the cause is paralysis, the latter idea being too thoroughly ingrafted into both the lay and professional minds.

CYST OF THE PANCREAS, WITH REPORT OF AN OPERATION AND EXHIBITION OF THE SPECIMEN

By RUFUS B. HALL, M. D., Cincinnati, Ohio

In the literature, cysts of the pancreas are described as true cysts and pseudo-cysts.

It is necessary, in discussing this subject, to recall the facts that a true cyst of the pancreas is a sacculated accumulation of fluid originating in the pancreas and retaining an anatomical connection with the organ. And a pseudo-cyst is an accumulation of fluid in the lesser peritoneal cavity about the pancreas. It is evident that the treatment of the two conditions could not always be carried out with the same surgical technique. True cysts of the pancreas are retro-peritoneal tumors; pseudo-cysts are intra-peritoneal accumulations of fluid. The cause and the mode of development of true cysts are somewhat in doubt. While there may be cases of dilatation of the duct by obstruction from calculi, it would be difficult to prove the exact cause except upon autopsy. That inflammation or traumatism play an important rôle in the production of true cysts, there can be but little doubt.

Judging from the literature, one would be inclined to believe that the tail of the pancreas is the favorite anatomical location for the development of these cysts. In the inflammatory process, effusion takes place into the glandular tissue of the organ, which results in degenerative changes, leading to the formation of an adventitious wall of an inflammatory material plus the artified pancreatic tissue, thus forming the true sac into which hemorrhages repeatedly occur. Such tumors are distinguished by their dark color and hemorrhagic contents and anatomical connection with the organ. The contents of pancreatic cysts are varied; but usually the fluid is of a brownish red or dark green. They are alculine in reaction, and contain albumen, fat globules, crystals of cholesterine, white and red corpuscles.

The fluid from the cysts quickly excites irritation. The size of pancreatic cysts varies from a small vesicle to an immense sac containing three or four gallons. The diagnosis of pancreatic cysts should be based upon the character of the contents of the tumor rather than upon the supposed demonstration of anatomical connection. The mere finding of the remains of the pancreas by the examining finger from within the abdomen is not positive proof that the sac is of pancreatic origin. It is a well-recognized fact that tumors within the abdomen often misplace neighboring organs or become attached to them, thus misleading the surgeon in his judgment. But if the contents of a cyst demonstrates the presence of pancreatic fluid, and the anatomical relations are those of a pancreatic cyst, little doubt should remain as to its true nature. These cysts, if they develop to any great size, may displace neighboring organs.

Salzer refers to one instance in which the cyst developed behind the abdominal aorta and vena cava, pushing these vessels forward towards the abdominal wall. In the author's case, fortunately those important structures were behind the cyst, yet they were firmly attached to it. The cyst wall

is prone to undergo degenerate changes from pressure necrosis, premitting the escape of its contents into the peritoneal cavity, or by fistulous communication into the alimentary canal.

In a large per cent of the cases, there is a history more or less definite of an abdominal injury. In many cases, the enlargement is observed soon after the injury; in others, years have elapsed. In other instances, the development of the cyst follows some acute disease, like typhoid fever, attacks of colic, or intestinal disturbances. While in a large majority, the course of pancreatic cysts is comparatively acute, a few weeks covering the entire history, but there are many instances on record in which the cyst has been known to be present for years without causing much inconvenience until some accidental hemorrhage, or rupture of the sac, or the pressure causing intestinal obstruction, brings the case to a sudden termination.

The subject of this report is Mrs. G. W. S., of Mason, Ohio, age forty-two years; mother of eleven children.

In November, 1897, she was delivered by Dr. Claton Hall, of Mason, Ohio. He discovered at that time that she had an abdominal tumor about the size of an ordinary cocoanut, which was not tender upon pressure. She was a strong and vigorous woman, a farmer's wife, had never needed the services of a physician excepting at confinement, which had always been normal, like the one at this time. The doctor only discovered the tumor in delivering the placenta. He regarded it as ovarian, but he could not explain why it was not movable. It remained above the uterus after her delivery. He advised her and her husband to have the tumor removed as soon as she was convalescent, but in the place of having a normal convalescence, as she had been accustomed to having at her previous confinements, within a day or two she developed fever. Her temperature ran from 100 to 102 for three or four weeks, and she was not able to leave her bed for four weeks after her delivery; but within two or three weeks after this time, she was in her normal condition, and felt so well and so little convinced from the presence of the tumor that she declined an operation for its removal.

Dr. Hall conferred with the writer two or three times about the management of the case during her illness. Within two years after this delivery, she gave birth to another child, with almost exactly the same clinical history following it; that is, fever came on in two or three days and continued three or four weeks. There was no indication that there was any infection in the uterus. There was no unusual discharge, but the abdomen was largely distended by gas. The patient was again advised to have the tumor removed, and said she would do so as soon as she recovered. At the end of four or five weeks she was again able to leave her room, and within a month or so was apparently perfectly well, excepting the presence of the tumor.

During the period from November, 1897, to January, 1906, she bore four children, and had two premature births at about four and a half months. Each one of the living children was followed by the same acute illness following delivery described above. In both premature labors she missed having any complications following delivery. The tumor steadily enlarged from the time it was first observed until her last delivery, on August 10, 1906, at which time the tumor appeared to be about once and a half the size of an adult head. In the first three deliveries she was attended by Dr. Hall. After his death, Dr. D. B. Hamilton, of Mason, Ohio, was her physician and referred the patient to me. The last delivery was followed within twenty-four hours by a severe pain in the region of the tumor and temperature reaching to 102 and 103. This illness continued with fluctuating temperature, and she and her husband believed that it would disappear like the preceding attacks, and declined to have an operation made. At the time of her delivery, her estimated weight was one hundred and eighty pounds, which was her usual weight for several years. She grew steadily worse, and within a couple of weeks after her delivery, she commenced to have chills at irregular times, followed by high temperature and sweats, and diarrhea. She would not consent to the operation and did not consent to one until January 8, 1907. She had been confined to her bed since her delivery on August 10, 1906. She was brought to the hospital on a stretcher, January 8, 1907. Her estimated weight was seventy-five or eighty pounds; her pulse rate was 136 to 150, and her temperature varied from normal and subnormal to 105 and 106. She had irregular chills, one or more every twenty-four hours, followed by profuse perspiration and almost collapse. She was very sallow and pale, apparently almost bloodless. She had been unable to take any food, excepting liquids, for several weeks, and she could not retain the liquids only when her temperature was down below 100. She vomited frequently at other times. There would be an interval of three or four hours each twenty-four, when she would take liquid nourishment.

During the time of the high temperature, she was listless, incoherent, and dazed. Her condition

was so very desperate that it looked like she would die within twenty-four hours at any time up to the time of her operation, which was made January 23, 1907. There were present and assisting, Dr. Joseph A. Hall, Dr. L. S. Colter, of Cincinnati, and Dr. D. B. Hamilton, of Mason, Ohio.

When she entered the hospital, examination revealed a tumor in her abdomen apparently the size of a seven-months gestation. It was dull over the whole front of the abdomen; it extended from the pubic arch to four inches above the umbilicus; both flanks were resonant. Vaginal examinations revealed that the uterus was retroverted, and the tumor did not occupy the pelvis. Fluctuation was distinct over the entire tumor. It was evident the cause of her sepsis was in the tumor itself. What the pathology was, was not so clear, but the opinion of the writer was that if any operation was made to relieve the patient, the tumor would be in such a pathological state that simple draining would not relieve her; that we must be ready to take the tumor out if we gave her any chance to recover. At this stage, I believed that the tumor was ovarian, and that she had infection in the tumor from some cause.

When the operation was made, the incision was made four inches long, commencing an inch below the unbilicus and extending downwards. I found what I hoped to find, that the entire tumor was adherent to the abdominal wall, without making any attempt to separate it more than to be convinced of this fact. The cyst wall was a dark chocolate color, looking almost the color of liver tissue. It was tapped with a large size Tait trocar, and about a gallon and a half of fluid of a dark chocolate color evacuated, which had a foul, smelling odor, similar to that of an iscio-rectal abscess. I believe the infection of the contents of the cyst was conveyed by the intestinal tract. Upon examination of the fluid, it was alkaline in reaction, and contained pus, crystals of cholesterine, blood corpuscles and fat globules, and a great amount of debris. I am convinced that there was an effort on the part of nature to establish a communication with the intestinal tract, and thus empty the contents of the cyst in that manner.

After the cyst was emptied, it contracted greatly. The adhesions to the abdominal wall were separated, and it was at once determined that it was in no way connected with the uterus or ovaries. They were perfectly normal, and were not adherent to the tumor. By sticking close to the tumor itself, we could enucleate it without great difficulty at the first part of the operation. The greatest difficulty appeared to be breaking through the tumor wall and fouling the field of operation, which was done on several occasions. The cyst wall varied greatly in thickness. As you will observe, it is about five eighths of an inch thick, excepting in numerous points there are places about the size of a quarter of a dollar that are very much thinner than the adjacent part. All of these thin places were very much more friable than elsewhere. It was in these thin parts that we easily tore through the wall of the sac in enucleating it. The bleeding was not very severe until we approached the back part of the tumor in the upper half of the abdomen. Here we separated some vessels that caused us considerable anxiety for a short time. We were able to soon control the bleeding and enucleate the tumor, which was attached well up towards the left costal cartilage. The pedicle was as thick as the finger. After ligation, in place of dividing it with the scissors, I was able to pinch it off with my fingers, showing the friability of the cyst wall. It was found after we had enucleated the tumor that the colon, as well as the small intestines, were in front, and that the tumor had been enucleated from the post-peritoneal cavity.

The patient suffered a profound shock and rallied very slowly. Convalescence was not established until the fourth day. She had a tedious and protracted convalescence. The sinus did not close for five weeks after the operation. The patient left the hospital six weeks after the operation convalescent, but quite feeble. She continued to improve, and after three or four months she had regained her usual health, and is now enjoying most excellent health.

The anatomical location of the tumor, its relation to the surrounding organs, and the character of its contents can leave no possible doubt that we had to deal with the true cyst of the pancreas, due to some obstruction of the duct in that organ. The case is unusual in having a long history of a well-defined tumor with comparatively little inconvenience, excepting following her confinements. Whether or not those attacks were due to some local inflammation about the capsule of the tumor, or some infection about the uterus, it is uncertain. But judging from her last attack coming on immediately after confinement, simulating the other attacks, one would be inclined to the opinion that the former attacks of pain and fever were due to inflammation about the cyst wall. The last attack probably commenced, as the former attacks, as inflammation of the cyst wall, but later in the progress of this attack, infection of the contents of the tumor was conveyed by the intestinal tract, and this infection was the cause of her sepsis.

A CASE OF FATTY DEGENERATION OF THE KIDNEY

Reported by ROBERT T. MORRIS, M.D., NEW YORK.
Professor of Surgery in the New York Post-Graduate Medical School and Hospital

Mrs. M. B., 54 years of age, was admitted to the Post Graduate Hospital in New York on May 29, 1907. Referred to my service by Dr. R. T. Irvine of Ossining.

A hæmaturia appeared seven years ago, and was at first accompanied by no symptoms which would give a clue to its origin. It lasted "for a few days." Every year since then, she has had hæmaturia for a few days at a time. Three years ago, she began to have pain ranging from the left hip to the back; and of late an extremely painful disturbance appeared in the left iliac region. It was spasmodic in character, and was believed to be a manifestation of the passage of gravel. Two months before the patient's entrance to the hospital, there was a marked increase in the amount of blood in the urine; and the spasms were accompanied by nausea and vomiting. There was frequent micturition, anorexia, loss of flesh; and sleep was constantly disturbed by the pain in the left iliac region. On palpation the left kidney was found to be much enlarged, and distinctly painful on pressure. A radiograph showed the kidney to be enlarged about one-third more than normal, but there was no shadow indicating the presence of a calculus. Urine acid, yellow, specific gravity 1010. Albumen present, with much pus. Few epithelial cells. No casts, crystals, or sugar. The ureteral catheter was not used, as there was no doubt about the site of the morbid process, and it was feared that the employment of the catheter might be meddlesome.

Diagnosis: Neoplasm of left kidney.

Two days after the patient's entrance to the hospital, I exposed the kidney by a transverse, extraperitoneal incision in the left lumbar region. On making a longitudinal incision along the convex aspect of the kidney, a mass of fat emerged suddenly. The kidney was removed. The drawing made some months later (Fig. 1) does not represent the loose mass of fat well, as it had shrunken considerably in the preservative fluid, and a portion had been removed for microscopical examination; but the cut shows the proportion of parenchyma that had degenerated into a fatty mass. The larger part of the remaining parenchyma was yellowish and fatty. A microscopical section of parenchyma, made by Dr. H. T. Brooks, showed the presence of chronic interstitial nephritis. Fig. 2 is drawn from a photomicrograph of the fatty mass which occupied the pelvis of the kidney, and part of the area which should have been parenchyma.

The patient made a good recovery.

Fig. 1. Fatty kidney. Drawings by A. J. Martin.

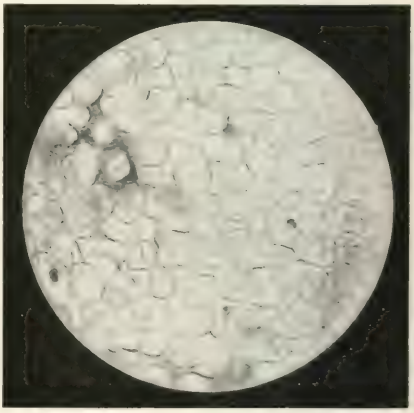


Fig. 2. Photomicrograph of kidney tissue.

THE ABDOMINAL INCISION[1]

By CLIFFORD U. COLLINS, M. D., Peoria, Illinois

Three muscles on each side of the abdominal wall pull on an aponeurosis in the central portion, which meets the aponeurosis of the other side at a line running through the center from top to bottom — the linea alba.

The external oblique pulls obliquely upward from above, the internal oblique pulls obliquely downward in the upper abdomen, and transversely in the central and lower abdomen, and the transversalis pulls transversely, as its name indicates. The combined pull of these muscles is from the linea alba. W. J. Mayo's transverse closure of an umbilical hernia is in accordance with this fact, and its success proves the truth of the principle involved.

One muscle on each side of the linea alba pulls straight up and down, parallel with it. The recti muscles are firmly enclosed in a sheath, formed by the aponeuroses of the three side muscles, except in the lower fourth where the posterior layer of the sheath is practically absent. The recti muscles are not adherent at any point to the posterior layer of the sheath. They are closely adherent to the anterior layer of the sheath at points called the lineæ transversæ. There are usually three of these transverse lines, one opposite the umbilicus, one between the umbilicus and the ensiform cartilage, and one at the level of the ensiform cartilage. As these lines correspond to certain ribs there may, occasionally, be more of them.

There are only four blood vessels of any consequence in the abdominal wall, the two superior epigastric and the two deep epigastric. These vessels run between and parallel with the fibers of the recti muscles.

The lower six intercostal nerves on each side run in the general direction of the corresponding rib, between the internal oblique and transversalis muscles, until they reach the outer edge of the rectus, the linea semi-lunaris, which they cross at practically a right angle, and penetrate the sheath. The location of these nerves was accurately pointed out by Blair (Surg. Gyn. & Obst., Aug., 1905), and they should be kept in mind and not be cut.

Madelung, in 1905, wrote on the "Post-Operative Prolapse of the Abdominal Viscera." (Verhandl. d. deutsch. Gesellsch. f. Chir. Berl., 1905, xxxiv. 2. Teil, 168-222.) He had collected 144 cases from the literature, six from personal communication, and added seven from his own practice. From these cases it was shown that the abdominal incision had bursted open at almost any time up to and including seventeen days after laparotomy. This has happened to both sexes, to patients of every age, and after all sorts of abdominal conditions, and even after exploratory incisions, where nothing was found. It is reported as far back as 1844, and occurs at the present time, with all our boasted excellence of technique. Low incisions have been most productive of this kind of trouble, and median rather than lateral incisions have conduced to it. The critical time is shown by his statistics to be the eighth or ninth day. Absorbable sutures have not been responsible, because it has occurred after the use of every kind of suture material, and after every form of closure. Coughing seems to be the particular factor which immediately brings it about. A generally depleted patient is, of course, more apt to have this sort of trouble, although it has happened when there was no visible evidence of interference with healing.

I have four cases to report of separation of the incision a few days after the operation.

Case 1. The patient had fibroids of the uterus with hemorrhages. She had flowed profusely for three weeks prior to the operation and had the pale, lemon-yellow color of anæmia. She was also very fleshy. A hysterectomy was done and the incision closed in layers, with continuous sutures of catgut. On the seventh day the nurse reported that the incision had separated. There seemed to have been no attempt toward healing on account of the bloodless condition of the tissues. The omentum had been drawn down over the intestines, beneath the incision, just before the abdomen was closed. This was fortunate, as the omentum kept the intestines from protruding out of the incision. The patient was taken to the operating room, and anæsthetized with ether, and the abdomen closed again with interrupted silkworm sutures, passed through all the layers. The aponeurotic layer was sutured edge to edge, with interrupted sutures of catgut. A drain was place at the lower angle of the incision. Her further convalescence was uneventful.

Case 2. The patient had a large fibroid of the uterus, with hemorrhages, the last hemorrhage being very severe and occurring just two weeks before the operation. Therefore she was very anæmic. A hysterectomy was done, and each layer of the incision was closed with continuous catgut sutures, reinforced by four interrupted Figure 8 silkworm gut sutures. She developed a cough after the operation, and the incision separated the entire length, in spite of the silkworm gut sutures. The tissues around the incision lacked vitality on account of the anæmia, and the sutures pulled right through them. On account of the bronchitis which caused the cough, I did not want to administer ether again, so the bowels were kept in with a

[1] Read at meeting of the Western Surgical and Gyn[illegible] Association in December, 190[illegible].

packing of gauze and the edges of the incision were drawn together with adhesive plaster. It healed slowly and she now has a large ventral hernia.

Case 3. This patient had a large cyst adenoma of the right ovary, and multiple fibroids of the uterus. The ovary and uterus were removed. She was very fleshy. The incision was closed with continuous sutures of catgut for each layer. On the seventh day she made a sudden movement in bed and felt something give. Examination showed that the incision had separated. The intestines were held in by the omentum, which had been drawn down over them before the abdomen was closed. She was taken to the operating-room and ether administered. The incision was closed with interrupted Figure 8 sutures of silkworm gut, the lower loop of the eight taking in aponeurosis, muscle, and peritoneum. A cigaret drain was placed in the lower angle of the incision. The healing process then went on without interruption.

Case 4. This patient had a carcinoma of the stomach, and was emaciated and poorly nourished. The incision showed that the glands were involved, and the growth could not be removed successfully, so a gastro-enterostomy was quickly done with a Murphy button. Each layer of the incision was closed with a continuous suture of catgut, reinforced with interrupted Figure 8 silkworm gut sutures. In a few days he developed a cough. On the thirteenth day the silkworm gut sutures were removed. On the fifteenth day the nurse reported that the incision had separated. The edges of the incision were friable and there had been little or no attempt at repair. I was away on a vacation, so one of my assistants took him to the operating-room, where the incision was closed. He died ten days later as a result of the carcinoma.

All of these incisions were longitudinal, and continuous through the recti muscles.

According to Madelung's findings, "those who believe that the use of a certain material, or of a certain form of suture, will successfully prevent the occurrence of post-operative hernia are in error." Then, it seems to me, the prevention must lie in better methods of making the incision.

In making the abdominal incision, two things are to be considered: First, the incision should be so placed as to give easy access to the pathology; second, it should permit of firm closure under conditions that will prevent a hernia.

Incisions should be placed so as to avoid cutting any of the intercostal nerves. It is a great deal more essential to avoid cutting the intercostal nerves than the blood vessels. The only two blood vessels of consequence are the deep epigastric and the superior epigastric arteries. The anastomosis of each is so plentiful that the tying of either vessel does not matter much, although it should be avoided when possible. But the cutting of an intercostal nerve may cause atrophy of the muscular structures it supplies, and thus cause a weakening of the abdominal wall.

The incision should be made through both aponeurosis and muscle, for two reasons. First, the muscle lends additional strength to the abdominal wall at the site of the incision, and second,

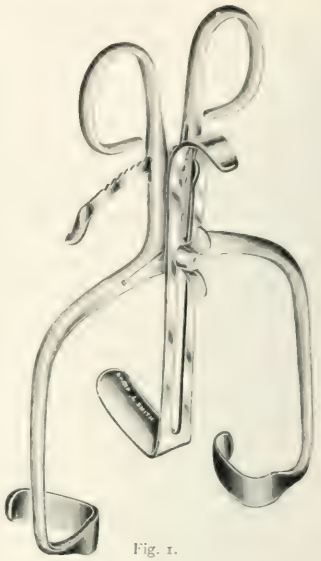


Fig. 1.

the muscle may be split and not cut, and in this way important structures, as nerves and blood-vessels, which lie in the plane of the muscles, will not be injured. An incision in the semi-lunar line, for instance, which is composed entirely of aponeurosis, with no muscle beneath it, must be cut all the way through, and, therefore, the intercostal nerves, crossing it in the line of the incision, must be cut.

An incision should not be continuous through all the planes of the abdominal wall at the same points. If a longitudinal incision is made in the median line, it is better to complete the incision through a rectus muscle on one side, instead of going on directly through in the linea alba. It is better still, if the incisions through the aponeurotic and muscular planes can be made in different directions, as in the McBurney incision.

The incision should be closed, in all cases, where possible. If drainage is necessary, it should be done through a small stab wound, in which the muscular and aponeurotic structures are split, and not cut, to one side of the incision, and not through the incision. In making an incision for the simple drainage of an abscess, the muscular and aponeurotic structures should be split, and not cut.

The best incision for the pelvis is Pfannenstiel's. The incision is made transversely through skin, fat, aponeurosis of the external oblique, and external sheath of the recti muscles, about one inch above the pubes. The internal oblique is split transversely, in the direction of its fibers. Then the recti muscles are separated in the median line, or either one is split longitudinally. No blood-vessels, or nerves of any importance, are encountered. The openings in the aponeurotic and muscular structures run in different directions, almost at right angles with each other, and thus practically insure the prevention of a ventral hernia. It has all the advantages of a McBurney incision for the pelvis. It permits of a very strong closure, the entire aponeurotic opening being underlaid with solid muscle, except at one small point, where the openings cross, and the opening in the muscle layer, being overlaid with a solid heavy aponeurosis, except at the same small point. The action of the recti muscles tends to pull the edges of the aponeurotic opening closer together. It gives ready access to the pelvis and plenty of room for any pelvic work.

The incision through the skin usually falls below the pubic hair line. When the hair grows out the scar is concealed. Particularly is this true when the patient is a brunette, with a plentiful supply of pubic hair. I have patients that no one can tell that they have undergone a pelvic operation through the abdominal wall. Patients will often consent to an operation through the vagina, but will object to an operation through the abdomen, on account of the resulting scar. This is particularly true of young females. If the scar is concealed, this objection will be removed.

I submit a modification of the Mayo-Simpson retractor, especially designed for use in the Pfannenstiel incision, although the third arm has proved useful in the ordinary longitudinal incision, in holding back the lap pads, and preventing the retractor from swinging around to either side. (See Fig. 1.)

I have now used the Pfannenstiel incision in one hundred and twelve operations. The first thirty were done with the cosmetic effect in view, and the transverse incision was made through the skin and fat, with a longitudinal incision through the aponeurosis and muscle. Then the strength of the closure, when the aponeurotic and muscular openings were made at right angles to each other, appealed to me, and I began to make the transverse incision through the aponeurosis also. The fact that the appendix was removed in ninety-six of these operations, through this incision, shows that it gives plenty of room to work through. In

Fig. 2

three of the operations, in which the appendix lay up behind the cæcum, it was necessary to make an additional McBurney incision in order to remove it. In these three operations, the appendix could not have been removed through the usual median longitudinal incision. In the one hundred and twelve operations, through this incision, every variety of pelvic work was done, including nineteen hysterectomies, some of which were for fibroids of the uterus. Some of the patients were very fleshy, so fat is no bar to the incision. The gall bladder can be felt and examined through it. Some of the operations were for pelvic inflammation, in which pus was found, and the incision became infected, but, so far as I know, there have been no cases of ventral hernia. In a recent case, the patient developed a severe cough immediately following the operation, but the incision did not separate. This incision can be placed a little higher for access to the central lower abdomen.

For the outer part of the lower abdomen, McBurney's incision is usually the best. The aponeurosis of the external oblique and the internal oblique and transversalis muscles are split, thus avoiding the cutting of any nerves or blood-vessels, and the openings through the aponeurotic and muscular structures are not in the same direction. If additional room is required, the split in the aponeurosis of the external oblique could be extended some distance in either direction. The opening in the internal oblique and transversalis muscles can be extended by cutting transversely across the semi-lunar line, and extended still farther into the sheaths of the rectus, by retracting the rectus toward the median line.

The ideal incision for the upper abdomen would be transversely through the skin, fat and aponeurotic structures (anterior and posterior sheaths of the recti muscles), with a longitudinal separating or splitting of the recti muscles. This gives a very firm closure, but does not give the access to the pathology that Pfannenstiel's incision does, for the pelvis and lower abdomen. I did a gastro-enterostomy through an incision made in this way, and the patient could have arisen and walked at once so far as any pull on the edges of the incision were concerned, and in this particular case, the operation was accomplished without much difficulty but it was a favorable case, and it was seen that the incision did not give much room in which to work. In the upper abdomen, the recti muscles are enclosed, both anteriorly and posteriorly, in a firm aponeurotic sheath that does not permit them to be retracted very far to either side when the sheath is incised transversely. In the lower fourth, the posterior sheath is absent, which leaves them free to be widely retracted.

But a diagonal incision from the inner edge of the rectus, down to the outer edge in the direction of the fibers of the internal oblique, through both anterior and posterior sheaths, permits of better retraction and gives better access to that region. A transverse cut across the linea alba, at the upper angle of the incision, and a similar one across the linea semi-lunaris at the lower angle, gives still more room in which to work. (See Fig. 2.) The rectus should be freed from the anterior sheath. This can be readily done by blunt dissection, except when a linea transversæ is encountered. In that case, the dissection must be carefully done with scissors, or a knife. It is very easy to cut across the rectus muscle at a linea transversa. The rectus is not adherent to its posterior sheath, and the separation is easy. The rectus may be split, or the entire muscle retracted to the outer side. If the muscle is completely mobilized, as it should be, it is usually easy to retract it entirely out of the way to the outer side of the incision. I have done gastro-enterostomies and gall-bladder work through this diagonal incision over the right rectus muscle, with the transverse extension at either end. So far, this has been sufficient to give enough room to work in, but, if the occasion demanded, a similar diagonal incision could be made over the left rectus, connected by the short transverse incision across the linea alba, and a very wide opening made which would give access to the entire upper abdomen. This has been done on the cadaver, but I have not found it necessary, so far, in operative work. In this incision, the openings through the aponeurosis and rectus muscle (if there be an opening made in the muscle) run in different directions. The incision in the aponeurosis runs in the general direction of the fibers of the middle side muscle, the internal oblique, and not at right angles to the general pull of the side muscles, as does a longitudinal incision through the linea alba, or the sheaths of the rectus. It does not cut any intercostal nerves.

Conclusion. 1. Abdominal incisions should be placed so they will pass through both aponeurosis and muscle.

2. The incision in the aponeurosis, and the split in the muscle, should run in different directions. This can be done in a large majority of abdominal operations.

3. A longitudinal incision should not be made through the linea alba or the sheaths of the rectus, at a right angle to the combined pull of the three side muscles, when it is possible to avoid it.

4. For very large tumors, and cases where the character and location of the pathology is in doubt, the longitudinal incision is probably necessary.

5. If the longitudinal incision is necessary, the split in the rectus should not be continuous with the aponeurotic incision, but should be placed to one side, and, preferably, through its inner half, to avoid the intercostal nerves which enter the outer half.

6. It will take longer time and more experience to demonstrate the correctness of these conclusions.

AN UNUSUAL OBSTETRIC COMPLICATION, CAUSING THE REMOVAL OF 126 INCHES OF SMALL INTESTINE

By H. J. DONALDSON, Williamsport, Pa.

The patient who presents the following history I saw, in consultation with Doctors Wilson and Burroughs, of Cross Fork, Pa.

She was delivered of a male child after a labor of eighteen hours, and an occipito-posterior presentation.

The labor passed off without any undue trouble until the final delivery, during the third stage, when the patient suddenly exhibited symptoms of shock, at which time she was given chloroform and forceps delivery made.

After delivery of baby, which occasioned a perineal tear, the placenta was delivered easily, but with it, much to the consternation of the obstetrician, an enormous mass of intestine.

I saw her at the end of 12 hours and found my patient in shock, temperature 100, pulse 160, respiration rapid, semi-unconscious. Examination of vulva revealed a laceration to rectum, and an enormous mass of small intestine lying between her legs, under her buttocks and over her legs. There was evidence of hemorrhage but none at the present time. The odor was awful. In places the intestine was filled with gas, again several feet would be paralyzed and stretched into a thin cord.

The intestine was simply stripped from its mesentery, and along this line thus made was a layer of clotted blood, showing the hemorrhage that had taken place was small in amount and easily controlled.

I next examined the cervix as well as I could by palpation alone, and found it not lacerated, but contracted down hard upon the intestines; it was, therefore, manifestly impossible to resect the paralyzed and infected gut and return it to the abdominal cavity per vaginam.

At 1 A.M., the patient was opened in the median line, and with the aid of two oil lamps for light, I turned out the uterus over the thighs, and after carefully walling-off abdominal cavity and its viscera, and washing protruding intestines, delivered, back through vagina and pelvis, and out of abdominal incision, the small intestine. Finding the lowest end of injured gut to reach to caecum, I cut it off and turned in the open end of caecum, with a circular suture, reinforced with several Lembert sutures of linen. Following up the infected gut until I came to where the mesentery had ceased to tear, I again cut off the gut and closed end of the small intestine in same manner. Then brought two ends together and did a lateral anastomosis, using Moynihan's suture method.

I then sutured the end of the mesentery to posterior line of anastomosis, so that it extended past the anastomosis to the healthy caecum. I did this, hoping to secure more nourishment, because I was afraid the entire tract was paralyzed, if not infected.

After this was completed, I turned my attention to the uterus, to repair the laceration in the body, which I found extending along the posterior surface, from fundus to about midway between internal and external os; here a line of rupture extended around the cervix, including about one half its circumference, just above the uterine arteries, making a T-shaped tear.

The anesthetizer informed me that the patient's condition was bad, so I sutured the tear as best I could, though it was almost impossible to place sutures in the circular tear, and after thoroughly washing pelvis, closed the abdomen, without drainage.

The patient was then brought to edge of table, vagina washed, perineum closed with silkworm gut, and a strip of 10 per cent iodoform gauze carried well into uterus, and another into pelvic cavity, through central portion of cervical tear.

The patient was returned to bed at 2 A.M., in seemingly a hopeless condition, but at 4:30 A.M. she was out of the chloroform, and her temperature was 98⅘, pulse 130, respiration 26.

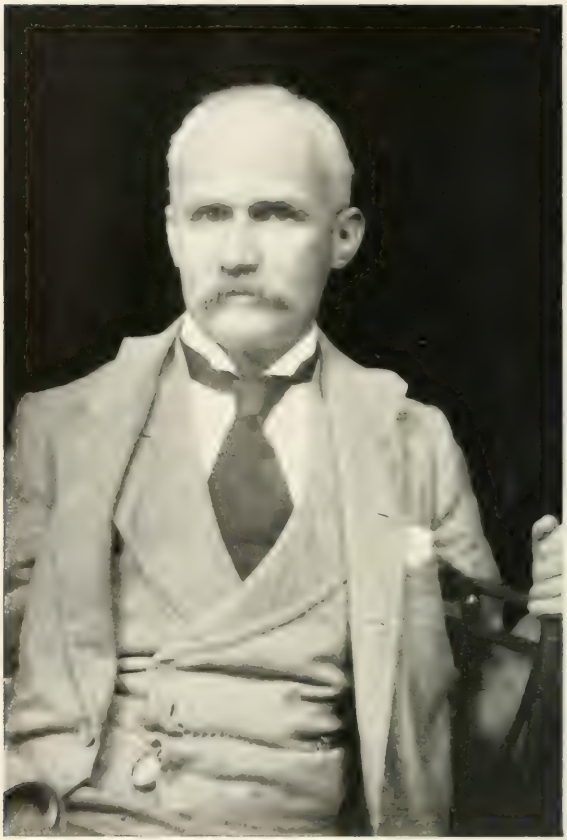
There was no nausea, and at 10 A.M. hot tea was given by mouth and by rectum a nutritive enema. Nutritive enemata were given every six hours from 10 A.M., August 19th to 10 A.M., August 24th, when nourishment was started, and well taken by mouth.

First bowel movement occurred spontaneously at 8 A.M., August 22d, and continued daily thereafter.

Patient continued in excellent condition until August 26th, when her temperature rose to 102⅘ after a severe chill at 6 A.M., and a foul, thin discharge started from vagina. Temperature that night was 104, and she began losing ground rapidly and died on August 28th, at 11:30 P.M., of septic metritis, the entire uterus seeming to be a sloughing mass.

After the operation was completed we measured the intestine removed and found it to be 126 inches in length. This caused me to doubt her ability to have enough absorbing area to live, it being nearly half of the small intestine; but as she lived ten days, and during the first seven days gained rapidly in flesh and strength, her bowels moving well, and she taking and retaining nourishment, I now firmly believe it possible to resect one half of the small intestine and have a patient enjoying fair health.

In reviewing this case, and knowing how well the patient felt as late as the 25th of August, "Well enough to get out of bed," to use her own language, I am led to believe, that had I been able to have added a complete hysterectomy to the operative measures used upon intestines, I would have saved a life; her condition at that time was too bad, however, to prolong the already hazardous operation. Again, the baby was born at noon August 18th, and the patient lay upon her exposed intestines, with an open avenue for infection for thirteen hours before the operation was undertaken, and infection certainly occurred, per vaginam, as the subsequent condition proved.



F. M. SANDWITH, M.D., F.R.C.P.

DEPARTMENT OF

NICHOLAS SENN FESTSCHRIFT

A TRAUMATIC CASE OF DIAPHRAGMATIC HERNIA

By F. M. SANDWITH, M.D., F.R.C.P.

Lecturer at the London School of Tropical Medicine and at St. Thomas's Hospital, London

ONE of the earliest writers on this subject was Dr. Bowditch, of Buffalo, who analysed 88 cases of all kinds of diphragmatic hernia which occurred between the years 1610 and 1864. In his list the hernia occurred 41 times on the left side, on both sides 3 times and only 18 times on the right side, for in 26 of his cases the site was doubtful. In 44 cases the stomach protruded into the thorax, in 30 the omentum was found there; and in no less than 9 patients the injury was caused by stabs with sword or lance, besides three doubtful cases under the heading of "wounds."

Struppler says that the number of recorded cases in 1901 had reached almost 500, and every succeeding volume of the Index Medicus tells us of additional instances since that date.

Excluding congenital cases, which constitute nearly half the published reports and are the result of some arrest of development in fœtal life, diaphragmatic hernia is interesting to both physicians and surgeons, because it is the form of internal hernia most commonly met with; and it is, so far as I know, the only form of internal hernia which can, under favourable circumstances, be diagnosed during life. Several cases, like mine, were suspected before death; but nearly always the accurate diagnosis has not been attained until the post-mortem examination.

The most likely traumatic causes are penetrating wounds or contusions of the abdomen, which accounts for the fact that most sufferers have been adult males. The abdominal organs entering the thoracic cavity are usually not covered by a hernial sac, consisting of peritoneum or pleura, thus technically producing a false diaphragmatic hernia. The left side is eight times more commonly affected, probably because the right side is protected by the liver.

The stomach is the organ which most frequently passes through the ruptured diaphragm, the transverse colon is also often involved, and, less commonly, authors have reported the presence in the thorax of the omentum and small intestine. In very rare instances, a portion of the left lobe of the liver or the pancreas and even the left kidney may actually be protruded into the chest.

Most authors confuse the congenital with the acquired cases, which makes their statistics less interesting. Mr. Pollock mentions two traumatic cases occurring in civil life. In the first, a man aged twenty, slipped while walking in his own house and gave himself a severe twist; death occurred 32 hours after admission to hospital; the opening of the diaphragm was then found to be in the posterior part of the left tendon, and was large enough to admit the hand. In a second case, a man, aged 40, fell from a great height onto the deck of a vessel, and died three months later; the rupture in the diaphragm was a little to the left of the œsophageal opening, about 2½ inches in extent.

In the present day, gunshot wounds are more likely than spears to effect an injury of the diaphragm. Among other cases recorded, I may mention four cases of gunshot wound of the diaphragm, reported by Sir Thomas Longmore. In the first, death occurred one year after the injury from strangulation after a full meal; in the second, the patient lived 22 years and then died from other causes; in the third, death resulted after six days from a double perforation of the diaphragm and a wound of the liver; in the fourth case, the patient succumbed after 16 hours from wounds of the lung, diaphragm, liver, and spleen.

For various reasons the following case has never been published, and it is, I venture to think, of sufficient interest to be placed on record.

At the beginning of 1884, while General Gordon was hurrying up the Nile on his last and memorable journey to Khartum, it became necessary to dispatch British troops to Saukin on the Red Sea coast, to deal with Osman Digna, who had succeeded in raising the tribes of the Eastern Sudan to enter on a holy war and fight in the Mahdi's cause. The tribesmen had been greatly encouraged by their recent success in annihilating a force of half-drilled, panic-stricken Egyptians, three times their number, who had been hastily massed together under the leadership of Baker Pasha.

On February 29, 1884, the British force found the enemy strongly posted at El Teb, and protected by parapets and rifle-pits. During the fight which ensued the cavalry charged the intrepid spearmen, who had all been assured of immediate Paradise and attendant houris in case of death. Many of the English riders lost their horses in the scrimmage, and of these only one officer, whom we will call X, escaped with his life. His horse was killed and he received thrusts from two spears which passed through his arm and penetrated his left side. Surrounded by numbers of yelling fanatics, he must have been killed had it not been for the devotion of Quartermaster-Sergeant Marshall, who rode to his assistance, seconded by Sergeant Fenton and Private Boseley. Marshall gave X his hand, and running in this fashion in rear of the charging squadrons, X, with the heavy spear swaying to and fro in his side, managed to get free of the enemy before he sank down. His attendant trumpeter, in spite of 16 terrible wounds, kept his horse going and escaped from the fight, to die of his injuries later.

X was carried safely back to camp and eventually to the Military Hospital

in Cairo. It was found that one of the spears had penetrated the wall of the chest between the ninth and tenth ribs on the left side, in the anterior axillary line. The wound was believed to be not deep, but it caused an external hernia of omentum, which was thought during life to be a portion of the lung. His wounds of arm and side healed satisfactorily, but two months after the injury there was still protrusion from the chest wound. The protrusion was bluntly conical in shape, with a base of two inches diameter and height of one inch.

Being a healthy man of 35 years of age, he was soon allowed to resume his military duties in a cantonment in the desert near Cairo. An exceptionally keen soldier, steeped in the best traditions of the British Army, and anxious to keep up the prestige of his regiment, which in previous campaigns had already done much to maintain the English hold on the Indian Empire, X could hardly be persuaded to spare himself either on parade or in taking an active part in the regimental sports, which are of so obvious a necessity for employing the leisure time of the men in a foreign country. Almost the only concession which he made to his friends' anxiety was to allow some one to run for him while he was batting in a cricket match.

On January 12, 1886, be was imprudently engaged in tent-pegging about 5 P. M., and, missing his peg, he received a severe shock and was obliged to dismount, owing to pain on the left side, which he at once connected with the upward thrust of the spear which he had received nearly two years before. On returning to his quarters, he was found by the army medical officer to be suffering from intense pain, chiefly referred to the epigastrium, but extending upwards towards the shoulders, outwards to the sides, and even to the vertebral column. There was great irritability of the stomach, but the amount ejected was small, consisting of mucus and, at times, grumous matter, resembling altered blood; his pulse was 75, of good volume; respiration normal except during the paroxysms of pain, when it became accelerated. Owing to the great agony he was in, a complete physical examination was impossible. His symptoms continued until 11 P.M., when the vomited matter increased in quantity, and was darker in colour;. this seemed to afford some relief, and he had painless intervals of about three minutes' duration. He became able to lie down, which had previously been impossible, but the slightest movement brought on a paroxysm of pain, followed by hiccough, retching, and vomiting of a small amount of fluid, which was considered to be in excess of the amount taken to drink. In spite of morphia, which was freely injected, he passed a sleepless night; and about 11 A. M., on January 13th, the pain again localized itself in the left side over the seat of the wound. As examination could now be tolerated, Surgeon-Major H. R. Green, from whose notes I am partly quoting, was able to find that there was dulness over the left pleura, as far up as the nipple line, and that on moving the patient, succussion sounds were produced, which were quite evident to the patient himself. The dulness changed with position, and above the nipple line the respiratory sounds were thought to be normal.

In the afternoon I was invited to see the patient in consultation, and found that a diagnosis of hyrdo-pneumo thorax had been made by the army medical officers in attendance, and that it was proposed to draw off some of the fluid by means of an aspirator.

I found that there was considerable dyspnœa, which I was told was of recent occurrence, the area of cardiac dulness was displaced to the right, there was some falling-in of the abdomen, while the affected side of the chest was filled out and the respiratory sounds were completely suppressed over the lower two-thirds of the pleura. The presence of abdominal symptoms (hiccough, retching, and vomiting), the original absence of dyspnœa, the remembrance that pneumo-thorax occupies the whole pleura, and a general feeling that this case was unlike the instances of pneumo thorax with which I was familar, caused me to dissent from the diagnosis; and the aspirator, which was in readiness, was removed. I suspected an injury to the diaphragm, but was hardly prepared for the state of affairs which I afterwards found. The patient was several miles from a hospital, and it was impossible to think of transporting him there, or even of performing any radical operation. Shortly after my arrival his symptoms became aggravated, collapse set in, and he eventually died of exhaustion at 10:45 P.M., about 29 hours after the tent-pegging.

Permission for an autopsy was declined, but circumstances enabled me 111 hours after death to make a limited examination of the body. The cicatrix on the left side was 1½ inches long, between the ninth and tenth ribs, and when the skin was removed the protruding tumour at that spot was found to be the size of a large walnut; it consisted entirely of omentum, which was firmly attached to the old wound, the length of the omentum between the curvature of the stomach and the attachment to the cicatrix was about 3 inches. The lower edge of the ninth rib was rough and bare, corresponding to the site of the wound. The left lung was lying in the upper third of the thorax. A huge rent in the diaphragm admitted both my hands flat, the edge of the opening being firm and elastic. The whole of the stomach was lying almost vertically in the left thoracic cavity above the diaphragm. The stomach contained a considerable quantity of grumous fluid. The hernia also consisted of much omentum and about one inch of duodenum, also lying above the diaphragm: the part resting on the diaphragm was extremely congested. The upper portion of the stomach, which consisted of the cardiac end, was normal both inside and outside. There was no abnormal fluid in either pleura, no wound of the left lung and no pleuritic adhesions. There was a marked difference of colour between the two lungs. The right was bright red, very much congested and emphysematous; the left was pale and ashy, and much smaller than the right; both lungs floated well. There was no apparent disease of heart, liver, or other organs.

It is impossiple to give an opinion as to how far or how little the diaphragm was injured by the spear wound, but it is probable that a perforation occurred

at that time, and that the fleshy part of the diaphragm was extensively ruptured, enlarging the perforation, at the time of the jerk when the patient failed to get his tent-peg.

Mr. Barnard, the latest writer on this subject, in pointing out the rarity of diaphragmatic hernia, states that it was found only three times in 13 years at the London hospital in 669 cases of intestinal obstruction, and in one of these three the obstruction was due to another cause. A case, something similar to mine, was operated upon by Battle; and Llobet successfully cured by operation, a diaphragmatic rupture which had occurred more than 10 years earlier. Other surgeons have recorded successes, provided the suturing has been done during the quiescent period.

REFERENCES

Barnard. Allbutt & Rolleston's System of Medicine. 1907, vol. iii, p. 782.

Battle and Mackenzie. A case of strangulation of the Stomach. Lancet., 1901, vol. ii, p. 1582.

Bergmann. System of Practical Surgery. London. vol. iv, p. 624.

Biddulph. "The XIXth and their Times." London, 1898.

Lacher. Deutsches Arch. für Klin. Med., vol. 27.

Llobet. Rev. de Chir., March, 1895.

Longmore. Holmes's System of Surgery. 3d ed., vol. i, p. 534.

Pollock. Holmes's Syst. Surg., vol. i, p. 874.

Rolleston. Nothnagel's Diseases of the Intestines and Peritoneum. 2d ed. Philadelphia & London. 1907. p. 568.

Struppler. "Über den physikalischen Befund und die neueren klinischen Hülfsmittel bei der Diagnose Zwerchfellsherie," Deutsch. Arch. f. Klin. Med., vol. lxx, p. 1.

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GASTROENTEROSTOMY

Probably no operation in surgery portrays the gradual evolution of an almost perfect method from a primitive and rude one better than gastroenterostomy. In compliance with the brilliant and pregnant inspiration of Nicoladoni Wölfler, who on September 27, 1881, performed the first anastomosis between the stomach and jejunum, applied the bowel to the anterior surface of the stomach, so that its proximal end lay to the right, and its distal to the left. The gut, that is to say, was antiperistaltic in relation to the stomach. A speedy change to an isoperistaltic application of the bowel was made; but in both methods the serious and lethal factor in the after history was the occurrence of "regurgitant vomiting." To avoid this, or to abolish it when occurring, Braun introduced the principle of enteroanastomosis, the proximal and distal limbs of the jejunal loop engaged in the operation being united. The results certainly justified the additional time spent upon the operation. It was not long, however, before von Hacker advocated the posterior operation; the hinder surface of the stomach being reached through the transverse mesocolon. The results both, immediate and remote, of this procedure were at first but little different from those achieved in the anterior operation. Vomiting occurred almost as frequently, and secondary operations were demanded for the relief of this most harassing complication. In 1900, Czerny, by the agency of his assistant, Petersen, suggested that the jejunum should be applied to the stomach as close to the flexure as possible. Probably no single alteration, which has been made in the operation is of a value equivalent to this. The posterior operation is better than the anterior, for no other reason than that it permits the abolition of "the loop." In respect of ease, of time occupied, of visceral exposure, and so forth, there is little to choose between the methods, and in cases where the posterior operation, for mechanical reasons, is impossible, the anterior is still practiced with adequate success. But the posterior no-loop operation, judged by the immediate results and by the freedom from later complications, is probably the most successful of all abdominal operations of equal severity. The line along which the jejunum should be applied to the stomach is not a matter, as yet, upon which all surgeons are agreed. W. J. Mayo applies the bowel so that it lies from above downwards and from right to left. I prefer to make the jejunum lie almost vertical, with a slight inclination in the opposite direction. The need for the nearest possible approach being made to the flexure has recently been again emphasized by Dr. Mayo, who points out the need for the division of the mesocolic band when it is of unusual length. Adhesions of the jejunum to the

under surface of the transverse mesocolon are sometimes found, and may extend over six inches or more of bowel. They are encountered not very infrequently, and so far as my experience goes, fix the jejunum always on the right of the flexure. These adhesions, both normal and pathological, must be separated until the highest portion of the gut is available for the anastomosis. The technical details in operation are now, it may well be, perfect or nearly so. It remains to discover before the abdomen is opened what are and what are not genuine cases of organic disease of the stomach. The mimicry of the symptoms of ulcer or of cancer may be so exact that the most expert clinician may be at fault. But when the abdomen is opened, the surgeon's duty, so far as concerns gastroenterostomy, is clear. This operation is never to be performed in the absence of a lesion of whose existence even the most sceptical onlooker can be satisfied.

B. G. A. Moynihan.

DR. STOWE'S TREATMENT OF PROLAPSE OF THE UMBILICAL CORD

At a recent meeting of the Chicago Gynecological Society, Dr. H. M. Stowe presented a new method for the treatment of prolapse of the umbilical cord when the os is not dilated sufficiently for immediate delivery. Believing that the greatest dangers to the child are from compression of the cord by a uterus emptied of its liquor amnii, Dr. Stowe injects normal saline solution into the uterus, having first closed the cervix by means of a modified Voorhees bag.

The idea of injecting salt solution into the uterus to replace the liquor amnii is not new, but Stowe is entitled to credit for having published it, and applying it as a distinct method of treatment of a condition that has a high fœtal mortality,— prolapsed cord. That it will do much to reduce this mortality remains to be learned from experience. In the first place, the cord must be replaced above the head, which is not always an easy procedure; secondly, the bag must be introduced before the cord falls out again, which may not always be possible; thirdly, if the cord can only be replaced in the cervix on top of the colpeurynter, even though salt solution is injected into the uterus, the cord may undergo injurious pressure. Nevertheless the idea is ingenious, promising, and deserving of widespread trial in practice. One could use Stowe's bag in other conditions, as premature rupture of the membranes, in shoulder, breech, and even head presentations.

Years ago the writer conceived the idea of injecting salt solution into the uterus in cases of detachment of the placenta (abruptio placenta), with a view of thus forstalling over distention with blood. In a case of abruptio placenta with ruptured membranes, a tentative application of Stowe's bag, with filling the uterus with saline solution, might be made, while preparations for delivery were under way.

The dangers in the use of the bag are the same as those inherent in all colpeurynters: laceration of the cervix, rupture of the uterus, tumultuous labor-pains, and infection. Perhaps this bag is more likely to inaugurate violent uterine contractions, so that care is to be observed in our first trials. We do not know the actions of the uterus when it is distended after having once partially retracted on itself, nor can we imagine the effect of redistention of an already partially retracted placental site. Would the dilatation and contraction of the uterus loosen the placenta? Probably not enough fluid would or could be injected to accomplish this. The patient will require the constant attendance of the accoucheur, and the liquid will have to be let out at first indication of undesirable action.

Joseph B. DeLee.

TRANSACTIONS OF SOCIETIES

REGULAR MEETING OF THE GYNECOLOGICAL SOCIETY, DECEMBER 2, 1907

DR. J. B. DE LEE, PRESIDENT
DR. FRANK W. LYNCH, EDITOR

EXHIBITION OF INSTRUMENTS

DR. J. B. DE LEE: I have here three instruments that are of some interest. Scientific tests have shown that it is impossible to sterilize the hands, yet we believe that it is possible to sterilize them sufficiently to prevent the patient from being infected, so that the patient can take care of a certain amount of infection that comes from hands not absolutely sterilized. Rubber gloves, however, can be sterilized so that a man who completes an operation with intact gloves can feel that his hands have not infected his patient. The greatest danger of sepsis is through perforation of the gloves, and I think we should evolve a special technique for the use of gloves. In other words, we ought to consider that every puncture of the glove is an error of technique. Since puncturing is the strongest objection to the use of the gloves, we ought so to build our instruments, and arrange the technique of our work and that of our assistants that this factor may be avoided. After every operation, the operator should test his gloves and then count the punctures. By means of this drill and experience one becomes more perfect; and a succession of 10 or 12 operations have been done without a single puncture of a glove.

It is along that line I have designed these instruments, the point being to avoid sharp points in their construction, and as far as possible all cutting edges. A knife of course has to be sharp, but I have found that nearly all other instruments can be just as well dull. For instance, this ordinary tissue forceps is perfectly safe for the glove and will grasp the tissues to be held as firmly as the ordinary rat-tooth forceps. I have discarded all rat-tooth forceps, they are no better than the Pean forceps. The vulsellum forceps, are the worst enemy of the glove and ought to be discarded.

Here is a forceps for grasping the uterus post partum, and for nearly all purposes where the ordinary vulsellum would be used. These curved blades hold remarkably well. They are constructed on a double inclined plane and the tissues slip along into an angle, so that they cannot escape. These have been used in practice and do well. In those cases where it is absolutely necessary to have a point, as for example, getting hold of a fibroid for enucleation, the vulsellum has to be used, but the points can be bent in so that the end of the instrument can hardly cut a glove, except under great stress.

NECROSIS OF LARGE SUBMUCOUS MYOMA COMBINED WITH GANGRENE OF THE LEG; RECOVERY AFTER OPERATION. Dr. Georg Schmauch.

The case is of Mrs. S., who had the good fortune to recover from an operation that seemed hopeless. She is 51 years old, and has been married since her 16th year, and pregnant 4 times, terminating in premature labor, Mens VII; abortion Mens V, Mens III, and II. Her menstruation began at 14 years and had been regular until 3 years before the operation, although she always lost considerable blood. Since that time she has flowed almost constantly, with some interruptions. During the last year her menstrual discharge assumed an offensive odor.

In 1897 she first noticed a tumor in her abdomen, for which she consulted a physician in 1901, who advised an operation for fibroids of the uterus. I saw her first on the 7th of June, 1905, in the Elizabeth Hospital. She was there on account of unbearable pains in her right foot. These pains began three weeks before in both legs; she felt as if the circulation had stopped in both limbs. As she would not consent to an internal examination, she was treated for sciatica.

When seen in the hospital, she was in a very poor condition, emaciated, exceedingly pale, with a cachetic color. Her temperature varied between 100 and 102½, her pulse was irregular and weak, 110 to 130. Heart sounds clear. The abdomen was distended in the lower part by a larger tumor, extending up three fingers above the umbilicus. This tumor was larger than a man's head, slightly movable and presented some small prominences. Per vaginam an enlarged portion was felt connected with this tumor; the os admitted four fingers and the cervical canal was dis-

tended by a large soft mass. There was an abundant, bloody and offensive discharge from the uterus.

The patient's right foot was swollen, inflamed and very painful on touch, the first and second toe showing the beginning of gangrene. The urine contained no sugar, but showed traces of albumen without casts. Both femoral arteries were pulsating. The diagnosis was necrotic submucous myoma combined with gangrene of the foot. Naturally the question arose, whether there was any connection between the gangrene of the foot and that of the myoma. At first thought it seemed self evident, yet it was remembered that a woman in poor condition might have a marantic thrombosis or spontaneous gangrene. Gangrene of the extremities is not so rare following gynecological operations in the puerperium and in eclampsia as was formerly considered, as Dr. Reed has shown to this Society. However, a necrotic myoma, leading to a gangrene, has to my knowledge not been described. I did not review the whole literature of sequelæ after myoma, as this is only a casuistic report.

A decision one way or the other had to be made, as upon it depended further treatment. The amputation of the foot was the less serious operation; however, the surgeon did not feel inclined to interfere before a clear demarcation had set in and also regarded the sloughing myoma as the primary cause of the trouble. So I decided to remove the uterus, on the 11th of June, 1905. The operation itself was a typical supra-vaginal hysterectomy except for the enucleation of one fibroid that had developed within the right broad ligament. One ovary was not removed. An iodoform drain was inserted in the cervical canal and brought out in the vagina, and the peritoneum was closed over the stump. The operation was interrupted three times because the patient became pulseless, although the greatest care was taken in administering the chloroform combined with oxygen.

The patient recovered from the operation, although she was in a very critical condition for the first 6 days. Her temperature arose on the first day to 102. Her pulse reached 136, and was irregular. She was almost constantly orthopnœic and daily had two or three attacks of cardiac asthma. A liberal use of camphor and morphin aided the recovery. Altogether she did not suffer so much from the laparotomy as from the gangrene of the foot, the hourly expected lung embolism did not occur.

On the 23rd of June, 12 days after the first operation, Dr. Thilo amputated her leg. A demarcation had not yet set in. The gangrene was progressing and the black colored foot emanated a very offensive odor. The amputation was made in the middle of the leg, and both the tibialis antica and postica arteries were found closed by thrombi. When the Esmarch bandage was loosened there was no bleeding. The amputation wound as well as that of the laparotomy healed per primam. I might mention that her left foot became quite œdematous after the first operation so that the presence of gangrene had to be considered. During this operation we met with the same trouble in the anæsthetic but less than in the laparotomy.

On the 10th of August, two months after the operation, the patient had recovered so far that we could risk sending her home. The pelvis was free from all exudate. She is now looking healthy and walks around with an artificial leg. I am not able to demonstrate to you the amputated leg, but here, you see the uterus which we removed. It has shrunk a good deal in the fixation fluid, yet the submucous myoma still measures 8 inches in diameter. There are three larger subserous myomata, and several small submucous myomata. How great the pressure must have been to which this submucous tumor was subjected can be readily imagined from the retraction of the uterine walls after they were cut open. At present the uterus does not cover more than one-fifth of the surface of the myoma. This is due to the serous imbibition by the myomatous tissue and is the consequence of the insufficient nourishment and the impaired circulation existing in such a tumor. Even an intramural myoma can become so much distended by this pressure that perforation in the abdominal cavity results, as reported lately by V. Franque.

Our tumor has no pedicle, and was inserted broadly on the fundus and probably would have caused an inversion of the uterus, could it have been extruded into the vagina. It is generally stated that such necrotic tumors produce labor pains, as the uterus tries to extrude the foreign body. This patient had no such symptoms.

The mortality of such operations is very high. Czempin reported in the *Berlin Geburtsh. Gesellsch.* a year ago, three gangrenous myomata operations, two of which succumbed to sepsis.

Whether our tumor had been infected by virulent micro-organism is very doubtful. That saprophytis had invaded it, is on the other hand, manifest from the discoloration of its surface and the offensive odor of the vaginal discharge.

Whenever possible we operate such cases per vaginam. In our case the tumor was too large. We still read detailed descriptions of how the various authors have tried to disinfect the de-

cayed tumor and the vagina. Krause for instance, thinks he saved some of his patients by tamponing the vagina with 10 per cent formalin gauze. I am more of a fatalist and do not have much belief in the disinfecting powers of antiseptics. For me it is an established fact, that all our antiseptics coagulate albumen, and therefore have none but a superficial effect, even in necroctic tissues.

It certainly is advisable to sew up the vaginal portion of the cervix. Vaginal douches of bichloride and iodoform gauze tampons were all that was done in my case. Histologically, the tumor does not show anything special. The uterus is generally myomatous. The small tumors are real fibroids, showing hyaline sclerotic degeneration, and the beginning of calcification. The large submucous tumor is not totally necrotic. The greatest part of the tissue is discolored and microscopically shows necrotic tissue that stains poorly or not at all.

The complete disappearance of all muscular tissue is worthy of note, contrasting vividly with the well-staining fibrous tissue, part of which gives the impression of young tissue. The growth is rich in blood-vessels; in most of them the circulation has ceased, and their walls are degenerated. In other parts the degeneration, following the course of blood-vessels spreads wedge-shaped through the tumor.

The mucosa excepting in the lowest part of the tumor is intact, yet is drawn out into a narrow line. The glands form long and narrow slits. In contrast to the degenerated interior parts of the tumor, the capsule seems to be fairly nourished. Many mast cells are seen as they are found regularly in myomata, even when calcified, mainly around the blood-vessels. This tumor shows them in greatest abundance in the capsule.

A few words regarding the combination of gangrene of the foot and necrotic myoma. As was said before, I regarded the necrosis of the submucous myoma as the cause of the gangrene. Whether it was the primary cause, is hard to prove. The debilitated condition of the patient, her extreme anæmia, her weak heart should be sufficient to warrant a marantic thrombosis. There never were symptoms of an infarct of the lungs. She coughed a great deal during the time the gangrene developed but no blood was expectorated. The embolus might equally well be derived from a thrombosis of the uterine artery and the spermatica, through their anastomosis. At the operation no special attention was paid to the condition of these vessels. The histologic examination of the blood-vessels of the leg has been, I am sorry to say, omitted. The intima did not show microscopically any signs of obliterating endarteritis.

I did not report this case for the purpose of calling your attention to the danger of myomata. A myoma is generally a perfectly harmless growth, unless it develops submucously.

Concerning the causes of the necrosis, I might repeat, what I said in reporting a case of mortification and spontaneous elimination of a large myoma in the *Central. f. Gyn.*, 1902.

It is a kind of anæmic necrosis, brought on by gradually diminution of nutrition. Such a tumor outgrows its natural supplies of nourishment. The consequences are disturbances in the circulation. Such a tumor does not become completely necrotic at once, more frequently a softening and liquefaction of the central parts take place. It is a slowly advancing necrobiosis.

While the cystic myomata of the uterine body are very seldom infected, those that develop submucously become so. In the case mentioned before, the softening had progressed so far that only a sac, the capsule, remained; it was a case of septic gangrene. It is doubtful whether bacterial influences played any part in bringing on necrosis in the case presented to-night. The favorable result of the operation speaks rather in favor of an aseptic gangrene. This woman would never have come to an operation, but for the gangrene of her foot; the myoma would have softened gradually and would have been expelled spontaneously.

DISCUSSION OF DR. SMAUCH'S CASE.

Dr. Channing W. Barrett: I thought in this connection it might be interesting to relate briefly a case seen recently at the County Hospital. I was called to see this case, which was in the service of another man. The uterus was supposed to be four and a half months pregnant, but I found it rather too hard to be pregnant that length of time. There was a body presenting through a dilated cervix, that, on first examination, might be taken to be the head of a fœtus, but it was found not to be. She lacked many of the symptoms of pregnancy and yet there appeared to be evidence that she was having an abortion. There were some contractions and the temperature at that time was 106. The septic gangrenous fibroids were cleaned out of the uterus and she immediately began to improve, but, contrary to Dr. Smauch's case, an embolus took place after several weeks, when she had almost gotten in a condition where we thought we would remove the tumor, and she had a septic condition of the lung. She then passed out of my care and I understand that she died later of sepsis of the lung.

REGULAR MEETING OF THE GYNECOLOGICAL SOCIETY. JANUARY 17, 1908

J. B. DeLEE, M. D., PRESIDENT.
FRANK W. LYNCH, M. D., [illegible]

EXHIBITION OF SPECIMENS

DR. J. B. DE LEE: I have here a specimen of fœtus compressus which was delivered last night. It is similar to one Dr. Reed exhibited a few weeks ago, and is only of clinical interest in the matter of diagnosis. The woman was in her second pregnancy and had been in labor since yesterday morning. The pains were infrequent and weak, and in the evening the physician recognized what he thought was a face presentation with prolapse of the arm. On internal examination the finger at once came upon a soft mass with sharp points, which was recognized as the depressed head of a fœtus compressus with sharp points at the edges of the cranial bones. The body lay across the os and prevented the engagement of the head. It was removed without difficulty, the pains came on very strongly thereafter and the child was born a few hours after. A portion of the placenta is completely thrombotic and organized, as is usual in such cases. The question as to whether this fœtus comes from uni-oval or bi-oval twins cannot be decided from examination of the placenta, because of the condition of the septum. The sex of this child is probably male, and the other child being female, would show that there were two eggs concerned in this pregnancy, because uni-oval twins are always of the same sex.

Dr. Chas. B. Reed then presented a case of repeated Mechanical Ileus in pregnancy, due to adhesions from appendectomy, and followed by abortion.

Mrs. K. S., age 24, married 6 years. Her health always had been good until 9 years ago, when she had appendicitis and was operated for it. She entered Wesley Hospital, November 18, 1907. The histories of her pregnancies was as follows: Five years ago she miscarried at the seventh month, the child lived 36 hours; three years ago, abortion at the second month; two years ago, premature labor at 8 months, the child lived. November 16, 1907, had a sensation of bloating while eating, shortly followed by excessive eructations of gas, together with a sharp cutting pain in the median line above the symphysis. Then developed vomiting of bitter greenish fluid together with food and mucus. No flatus was passed by bowel, nor any fæcal matter, save a few small particles which came away with an enema. There was no history of a definite chill, although the patient occasionally felt feverish. She stated that the urine had been passed with difficulty and intermittently since the beginning of the attack. It, however, was clear and apparently normal in appearance. She gave the history of similar attacks preceding the first, second, and fourth pregnancies, with abortion or premature labor following in each case. On admission, the temperature was 100.2 F., pulse 110, respiration 26.

In view of the history, a diagnosis of Ileus, due to pressure from the growing uterus, was made; and operation was decided upon to preserve the present pregnancy if possible, but at least to aid future ones.

Operation. Median incision: bowels found adherent to the scar in the right abdominal wall, near the former site of the appendix. The adhesions were dense and the bowel was liberated with difficulty. The uterus was enlarged to the size of a six and one-half months' pregnancy, and was pressed firmly upon the adherent bowel and compressed it, thus causing the obstruction. After the operation, the bowels responded to enemas and the patient passed gas and fæcal matter. Labor began six hours after the operation, and the woman delivered herself in three hours of an infant that lived a few hours. Twenty-four hours after the operation the temperature was 100. F., the pulse 120, and respiration 24. From two to four bowel movements occurred daily after the operation. On November 22 the temperature, pulse, and respiration fell to normal, and since that time there has been normal convalescence.

DR. C. W. BARRETT, then reported a case in which retained membranes, together with abdominal symptoms, following thrombosis of the mesenteric vein, simulated rupture of the uterus.

I wish to report briefly a case in which some portions of retained placenta together with thrombosis of the mesenteric vein simulated rupture of the uterus with prolapse of bowel through the rent in the uterus. The case was referred to my service in Cook County Hospital, with the following history. She had been delivered in the obstetrical service of the hospital three days previously. It appears that the interne who attended her at that

time, found the placenta retained and attempted its manual removal. As this proved very difficult, he presently desisted in his attempt and some time later the placenta was expressed torn and ragged, so that it could not be determined whether it was complete or not. For two days the patient did well. Then appeared fever and presently distension of the bowels. On the evening of the third day, something was seen protruding between the labia. After examination the interne reported that the protruding mass was bowel.

When I saw the case there was no difficulty in tracing the mass up to the uterus, and thinking it was bowel I feared to exert pressure upon it, but thought it wiser to open the abdominal cavity and work from above. Accordingly incision was made and the fundus inspected. Much to our surprise no rent in the uterus could be seen, and save some adhesions of the sigmoid no bowel could be found in close apposition with the uterus. The condition of the small bowel was then determined. A large part appeared gangrenous and near the duodenum was adherent. Altogether about 12 inches of the upper gut was absolutely dead; and as we traced it downward, marked disturbance in the circulation was seen so that little, save that part immediately proximal to the cæcum, was perfectly normal. Inasmuch as the necrosed portion of the bowel was so extensive that its removal appeared incompatable with life, the larger part of the small gut was placed upon pads and observed while salt sponges were placed around it. It appeared to improve in color while this was done: so in the forlorn hope that it might improve after release of the adhesions and the resection of the gangrenous portion, the upper and necrosed portions were resected and the ends joined with a Murphy button. Immediately after the operation the patient's condition appeared to improve, but the next morning she was seized with apnœa and became blue and died suddenly. The cause of death was not absolutely known, although it was believed that it was due to pulmonary embolus. No autopsy was held, save the abdomen was opened sufficiently to secure the button. At that time the intestines were observed to be nearly black for a considerable distance below the point of resection. No thrombus could be determined.

I neglected to say that during the operation, after the abdomen had been opened and no perforation of the uterus discovered, an assistant examined below to discover the character of the mass that had been mistaken for bowel. This was found to be a portion of placenta which had become inverted, and due to the accumulation of fluid behind the membranes, gave the appearance of bowel. This furnished the vaginal symptoms, while the disturbance of the circulation of the bowel gave abdominal symptoms which simulated rupture of the uterus with prolapse of the intestine.

Dr. Channing W. Barrett then read a paper entitled, The Fallacies of Intra-Abdominal and Atmospheric Pressure as Supports of the Uterus and other Abdominal Organs. (See page 369.)

DISCUSSION OF DR. BARRETT'S PAPER

Dr. C. S. Bacon: This is a very complicated subject and it would be easy to get lost in its discussion. I believe many of the statements the writer has made are correct. He has called attention to the mistakes made by some authors, but I cannot help feeling that there are one or two points that have been left obscure; and I believe the writer himself is in error on one or two points. The object of the discussion is a study of the supports of the uterus and of the pelvic and abdominal viscera; and I would begin with one of his conclusions, namely, that the uterus is held in place by its supports. He does not state what those supports are, and without such statement it is rather difficult to know exactly what is meant. He speaks of the support that is obtained from the round ligaments, the utero-sacral ligaments and also from the broad ligaments. The broad ligament as a support of the uterus is somewhat complicated. Just where the support to the uterus comes in the broad ligament, needs careful elucidation. The peritoneal covering which forms the fold of the broad ligament, we might say has some value, but I take it the chief support there is from the fibers that adhere to the uterus and run into the uterus, following the vessels that end in the uterus. That is what I understand by the broad ligament being a support of the uterus. Those supporting fibers have been described by some as the cardinal ligaments.

The statement that the uterus is held by ligaments and is not held by pressure, is a question I would like particularly to consider, especially the statement of the writer as to Sielski's argument on the value of atmospheric pressure in holding the uterus in place. It is not clear to me, notwithstanding the arguments of the writer, that atmospheric pressure has no bearing here. It was not clearly stated by him what *intra-abdominal* pressure is and how produced. The writer seemed sometimes to distinguish intra-abdominal pressure from force produced by gravity or some other force. But without considering that, it seems to me that atmospheric pressure has a bearing in the abdominal cavity as much as it has outside of it. The simple fact that two surfaces are within

the abdominal cavity does not mean that they are not exposed to atmospheric pressure. So I fail to see why atmospheric pressure does not have some bearing on organs like, for example, the bladder, the uterus, the diaphragm and the liver when inside the abdomen. The old experiment, the author called attention to of the smooth stone lifted by atmospheric pressure, by the leather or rubber disk to which a string is tied, it seems to me is very similar to the lifting of the liver by the diaphragm. We have the diaphragm in contact with the upper surface of the liver, and whether the liver and the diaphragm are inside of the abdominal cavity or outside, the atmospheric pressure is certainly going to keep the two surfaces in union until something pries them apart. It is the same with the uterus.. The normal uterus lies upon the bladder. When it is flexible and smooth and the bladder wall is also flexible and smooth, the two adhere by reason of atmospheric pressure; and until something comes between them, until they are pried apart, they are adherent. I think atmospheric pressure has some force in holding the uterus in that position, and some force in holding the liver against the diaphragm. I do not see how that can be disputed.

Now, what can get between them? Of course in the experiment which the writer gives in the specimen just passed around, we have free fluid circulating, and this fluid easily rushes between two surfaces. That is true. But a certain amount of tension is required before they separate so that the fluid can rush in. Besides, in the abdominal cavity we have not exactly the same conditions as here; there is ordinarily no free fluid. But even in the experiment I should feel like disputing the writer's assertion that the glove finger is easily separated from the bladder wall. If one picks up a portion of the wall, next the edge of the finger, the fluid rushes in, but if it is picked up carefully opposite the middle of the finger you will see that the finger does follow the wall. So I should dispute the statement that it very easily separates. If we make this experiment with exactly similar conditions to those inside of the abdomen, we must be careful to separate the wall from the substance inside at the middle, so that there is a surface that is adherent around the circumference of the point of tension. In short, I cannot agree with that portion of the paper where the statements of Sielski are attacked as being absurd. I believe atmospheric pressure acts inside the abdomen just as much as it does outside; acts everywhere, and without that support I believe the ligaments would soon lose force.

I will not go into any other points of the paper, except to call attention to one statement which perhaps was made inadvertently, or perhaps I did not hear aright, namely, that the vagina is a part of the levator ani muscle. The vagina is not attached to that muscle, which simply surrounds the vagina. Strictly speaking, the vagina is not a part of the floor, in the sense that the lower portion of the rectum is, that is, connected with the levator ani.

Dr. J. B. De Lee: I will say nothing about the physics of the abdomen, but on the question of natural philosophy I would like to say a word in defense of Penrose. I have many times held a tube full of water vertically and the water would not run out, but if I slanted the tube so as to let air reach the surface of the water, it would run out. I have filled a wine-glass with water and put a piece of tissue paper over it, inverted it and atmospheric pressure held the water up in the wine-glass. The reason a wine-glass cannot be held inverted full of water and uncovered, without its running out, is because it is impossible for the human hand to support the glass in a perfectly vertical position; the under surface will always receive a tilt which will start a current of water on one side and of air on the other side. So I would side with Penrose on purely physical grounds.

Dr. Channing W. Barrett, in closing the discussion, said: Dr. Bacon's discussion agrees exactly with Dr. Sielski's opinion, that is, the organs in the abdomen are quite different from anything else that we have to deal with; we cannot look through the mask and see how certain organs arrange in the abdominal cavity, and that these organs must have a certain support other than atmospheric pressure. This rubber bag (holding an apparatus in his hand) simulates the abdomen as completely as can be. We have the elastic sac, the glove fingers with their contents completely filling the sac, with a little fluid in the cavity. There is always some fluid in the abdominal cavity, and sometimes there is a great deal. Dr. Bacon calls attention to the fact that this rubber glove is not like the abdomen, because there is fluid in this sac. If the absence of a quantity of fluid in the abdominal cavity is the thing which makes atmospheric pressure supportive, then this support is lost as soon as ascitic fluid accumulates. To be brief, there is nothing in the question of atmospheric pressure as a support to the abdominal organs. It does not support the organs in the abdomen any more than it supports wood in a stove, wheat in a sack, or pictures on the wall. It cannot be counted upon to support the abdominal organs any more than we can count upon atmospheric pressure to hold a building up. Out

at the stock yards they realize that if they are to put intestines in a tub, the tub must be right side up; that they cannot depend upon atmospheric pressure holding them in a tub bottom-side-up.

Dr. Bacon calls attention to the fact that this rubber glove is not like the abdominal cavity, and yet he uses his best argument in saying that it is like the abdominal cavity; that a great deal of resistance is encountered in pulling the wall outward. If Sielski and Dr. Bacon mean that pulling the abdominal wall from the intestine lying next to it requires overcoming the resistance of the abdominal wall itself, I agree with them. We have to overcome the resistance of this elastic wall to pull it away from its contents. The illustration of the rubber disc and the stone, of which Dr. Bacon speaks, has no bearing whatever upon this: because in making traction upon the disc, it is raised in the center thereby causing a vacuum which has to be overcome. Here one intestine may be made to leave another fairly easily. There is no more difficulty in moving the contents of the sac here than if there are in a pail. Atmospheric pressure tends to prevent a vacuum within the sac, but it presses the sac inward at the point where the contents have less tendency to make pressure, that is, in the upper part of the sac.

In regard to the vagina attaching the uterus to the pelvic floor, I would say that the uterus lies above the pelvic floor and receives no support directly from the pelvic floor.

Dr. DeLee says he has often held a tube bottom-side-up and the contents staid in. I will say that he can do this only in the case of a capillary tube. He has filled a glass with water, placed a paper over it, turned it bottom-side-up and had the paper remain on. True; why? Because the moisture around the paper furnished capillary traction that keeps air from entering the glass; but we must remember that Penrose gives this as an illustration of why the intestines do not fall out through the pelvic floor, when the woman has laceration of the perineum. Dr. DeLee says that Penrose's illustration holds good in any sized tube, if it is held absolutely perpendicularly. The water runs out of the tube because of his inability to hold it perpendicularly; yet can a woman be depended upon to hold her body more perpendicularly than Dr. DeLee can hold a test tube? Penrose undoubtedly made a mistake and meant a capillary tube, but that has no bearing upon the question, because, when dealing with the capillary tube, we are not dealing with a woman.

Gilliam speaks of making a single tap in a barrel without escape of the contents. I believe the contents of the barrel may escape more rapidly if an opening is made above the fluid, but they will just as certainly escape through one opening made at the lowest point.

Dr. Herbert M. Stowe then read a paper entitled, "The Death of the Mature Fœtus in Labor." (See page 356.)

Dr. Lynch: I would ask if Dr. Stowe made any effort to ascertain the site of the cerebral hemorrhages? What proportions were localized about the meningeal arteries and were due to a rupture of those vessels, and what number at the base of the brain?

Dr. Stowe: Fifteen or twenty per cent were due to the rupture of the meningeal vessels, and about 50 per cent were noted in the base of the brain.

Dr. Lynch: Did you consider the hemorrhages in the base of the brain as the primary cause of death?

Dr. Stowe: It is always hard to ascertain the exact cause of death in children. Probably these children died from hemorrhage into the lungs, or into the lateral ventricles.

Dr. Lynch: The matter is of interest to me because I believe that in many instances, especially in children who have died in the uterus before term and before the onset of labor, we frequently see engorgement of the vessels at the base of the brain together with some little extravasation of blood and serum about the vessels. I am sure that many have believed that this caused death, although it has always appeared to me that it was better interpreted as a phenomenon occuring in the death agony. I mention this because I have in my mind a certain surgeon, well known as a specialist in brain surgery, who advocated very properly operative measures upon children who were thought to have cerebral hemorrhage. I happened to see the material which he studied preliminary to his first operations in such cases. Many of the autopsies were upon still born premature children, and he, in my judgment, erroneously interpreted slight extravasations of blood at the base of the brain as the cause of death, and used the cases as illustrative of the frequency of cerebral hemorrhage following trauma in birth, thus giving figures unduly high. Had he been as familiar with the pathology of the new born as he was of mammary cancer, his paper would not be open to criticism. Hemorrhage from rupture of the meningeal arteries is not found in small premature children born after short spontaneous labors.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

JOHN B. MURPHY, M. D.
FREDERIC A. BESLEY, M. D.
WM. C. DANFORTH, M. D.
E. WYLLYS ANDREWS, M. D.
WM. R. CUBBINS, M. D.
M. G. SEELIG, M. D.

ABSTRACTS FROM THE FRENCH CONGRESS OF MEDICINE HELD IN PARIS, OCTOBER 14–17, 1907

MME. PAUL REINOS

ULCER OF THE STOMACH

There was a discussion on ulcer of the stomach in which several surgeons participated.

M. LINOSSIE said that simple ulcer of the stomach has a natural tendency to cure. In his opinion, the indication is to remove all those causes that interfere with healing. These causes are the movements of the stomach, the irritation due to food, and the digestive action of the gastric juice. The therapeutic means of our disposal are of three kinds: dietetic, medicinal, and surgical.

The dietetic measures would like to suppress all gastric activity. They wish to obtain physical rest of the stomach, so as to facilitate the cicatrization of the ulcer. In practice, the dangers of inanition are an obstacle to the realization of this complete stomachic rest. There are two forms of extra-gastric alimentation — the subcutaneous and the rectal. Excluding water and salts, subcutaneous alimentation can furnish to the organism only fatty substances; that is, food substances which are highly thermogenic, but only slowly utilizable. Subcutaneous injections of albumen and of sugar are dangerous. Rectal feeding, though far more important, is insufficient. The quantity of albumen absorbed cannot suffice to maintain the *nitrogenous equilibrium* in an individual, fed exclusively per rectum. Emulsified fats are absorbed, but always in quantities inferior to those which normal alimentation introduces into the human organism. Despite its shortcomings, there is no valid reason for the non-employment of rectal feeding. It does not disturb, or only to a very slight degree, the stomachic rest, either from the standpoint of secretion or motility.

Treatment by absolute stomachic rest is essentially a temporary treatment, to which must succeed a treatment based upon rational dietetics. The food of a patient suffering from ulcer of the stomach should meet the following requirements: It should cause no irritation of the stomach wall; thus it should be liquid or *soggy*, and neither too warm nor too cold. It should remain the least possible time in the stomach. It should excite to the minimum the secretory activity of the stomach, so as to lessen as much as possible the digestive action of the gastric juice upon the walls of the ulcer.

This problem exists: Is it more useful to reduce the gastric secretion to its minimum, or to make no attempt to reduce it, but to neutralize it by albumenoids which will saturate the gastric juice after it is produced? Cruveilhier first suggested the use of milk in these cases, and we believe that a milk diet is the diet which best meets the therapeutical indications present, being superior to the albumenoid diet of Lenhartz and to the fat diet of Senator.

The medicinal treatment is only of secondary importance. Alkalies and bicarbonate of soda have a soothing action during the acute period. Subnitrate of bismuth, in big doses, quiets the pain but does not modify the hyperchlorhydria. To us the use of nitrate of silver or perchloride of iron seems of doubtful benefit. Olive oil is, usually,

poorly tolerated. Karlsbad water only slightly hastens the evacuation of the stomach.

Surgical treatment is first indicated after medical treatment has failed. The excision of the ulcer is an operation of exception. The most useful operation is gastro-enterostomy. It is especially of benefit when a pyloric stenosis co-exists. Simple, non-complicated ulcer of the stomach demands medical care; to be successful, medical treatment should be sufficiently thorough and prolonged.

Complications of Gastric Ulcers and their Treatment. Castaigne et Dujarier.

Complications of gastric ulcer may be supra-acute, acute or chronic. *Supra-acute complications:* Among these, we will mention diffused peritonitis due to perforation, a diagnosis of which should be made at the onset by the *suddenness*, the intensity and the seat of the pain. Repeated vomiting, abdominal distension, alterations of pulse and temperature are symptoms of perforation, but they may or may not appear immediately at the onset of perforation. One must not wait for their appearance to make the diagnosis. Surgical intervention should be early. As another complication, we have profuse hemorrhages, due to the involvement of an artery by the ulceration. These hemorrhages imperil the life of the patient. In a general way, the results of intervention in these grave hemorrhages are very inferior to those of medical treatment.

Acute Complications: Localized peritonitis, perigastric and subphrenic abscesses. They are often of difficult diagnosis. The treatment is surgical. It consists in finding and incising the pus-collection, and evacuating its contents.

Chronic Complications: They include accidents, some of which are mechanical, due to the development of fibroid tissue around the ulcer: Perigastritis and various forms of stenosis, cardiac, medio-cardiac, and especially pyloric; others affect the body of patient in general, determining anæmia and nervous disturbances, etc. Another possible chronic complication, according to some, is the transformation of the ulcer into a cancer, and the development of the cachexia of malignant disease. These chronic complications, as soon as they have been positively diagnosed, demand surgical intervention.

What can we expect of the different forms of treatment?

Medical treatment gives the best results in the abundant hemorrhages, in pyloric spasm, in disturbances of the general health. It often prevents complications and should be continued after surgical intervention, so as to obtain the maximum benefits of the latter.

The operative treatment cannot be recommended as a prophylactic measure. When it becomes necessary, what shall it be? A gastro-enterostomy is the most ordinarily performed operation, and perhaps is the most useful. It places the stomach, the seat of a pyloric ulcer, in a mechanical and chemical condition that favors the healing of the ulcer. Pylorectomy suppresses the pyloric ulcer, and would seem to be (a priori) indicated in all the cases. Its limitations are partly due to the fact that gastric ulcers are frequently multiple; partly to the fact that owing to the presence of dense adhesions, extirpation is not practicable. It is possible for a new ulcer to develop after pylorectomy. Thus there is no really curative operation for ulcer of the stomach. Any of the different operations may be indicated, depending upon the circumstances. We must always keep in mind the complications that may follow the operation — the vicious circle, peptic ulcers, and the secondary dyspeptic syndrome. To avoid them, it is necessary to institute a prolonged medical treatment. We think it would be dangerous to accept the conclusions of some surgeons, that ulcer of the stomach is incurable medically, and that the condition belongs entirely to the domain of surgery. The following conclusion is more in harmony with facts:

Round ulcer of the stomach, in the absence of complications, should be treated medically. If complications develop that demand surgical treatment, the latter should be immediately instituted. After operation, the patient must be subjected to medical treatment; otherwise new accidents may develop.

Doyen. The former speakers have acknowledged the value of surgical treatment for the complications of gastric ulcer. The operations then performed are *emergency* operations, the advantages of which are not debatable, whether we are dealing with an alarming hemorrhage, or a perforation, or a case of complete stenosis, or a bilocular stomach. I shall discuss exclusively the surgical treatment of uncomplicated ulcer of the stomach.

Two operative procedures are here of value. The resection of the ulcer and gastro-anastomosis. Resection of the ulcer is an exceptional operation. It can be performed only for an ulcer of the pylorus or of the greater curvature. I have practiced this operation twice with success in a case of a circumscribed pyloric ulcer. I performed a pylorectomy with a gastro-enterostomy. Upon another patient, I resected a bleeding and very painful callous ulcer, located near the greater curvature. The functional results following these two operations were perfect. This operation is impractic-

able, if the ulcer be seated upon the lesser curvature, or upon the *fundus* of the stomach.

We come to the question of gastro-anastomosis, of which I have been one of the promoters for the treatment of gastric ulcer. The distension of this organ, alternating with its evacuation, is one of the particular causes of the non-cicatrization and of the persistency of gastric ulcers. In 1895, I said that "all non-cancerous affections of the stomach which do not yield to medicinal measures, and which provoke a serious wasting of the organism, are henceforth in the domain of surgery." I demonstrated, in 1895, the important rôle of spasmodic contracture of the pylorus in gastric pathology. In dyspepsias, and particularly in ulcers of the stomach, the pylorus is the seat of a reflex spasmodic contracture which leads, in the end, to a hypertrophy of the sphincter. I have shown that a well-performed gastro-enterostomy causes a disappearance of the ulcer of the stomach, and I have since acquired the certitude that when the operation is unsuccessful, it is due to the defective working of the new pylorus. Pyloroplasty of Heinecke and of Mikulicz, appear to me very inferior to gastro-enterostomy. Gastro-enterostomy presents the advantage of being applicable to all cases. It does not, however, re-establish the normal working of the stomach as well as a well-performed good pylorplasty.

In 1898, I modified the technique of pyloroplasty. In a case of pyloric ulcer, located at some distance from the pylorus, and in which the first portion of the duodenum was very accessible, I performed a new operation, gastro-duodenostomy, with section of the pylorus. I recommend this operation in all cases of gastric ulcer located at some distance from the pylorus. The operation can be performed in from twenty to thirty minutes and gives excellent therapeutic results.

Hartmann, Paris. First of all, the surgeon must beware of nervous dyspepsias. For simple gastric ulcers, surgical treatment can be of great service. Performed under good conditions, the operative mortality is almost nil. The late results are good. Should a patient, later, owing to errors of diet, have accidents, these heal far better with medicinal measures than they would if surgical intervention had not been previously resorted to. The operative indications are: pyloric or medio-gastric stenosis, small repeated hemorrhages, adhesive perigastritis, non-complicated ulcer which has not been benefited by medical treatment, and especially if the pyloric syndrome is present. There is no debating the fact that perforation and perigastric abscess are imperative indications for operative treatment. Pylorectomy should be employed in those cases where one fears cancer, and in those cases in which the ablation of the pyloric ulcer is not surrounded by too great difficulties. Gastro-enterostomy is the operation oftener performed. Once gastro-enterostomy has been performed, the patient should be put in the hands of a physician, who will decide as to his diet and as to appropriate internal medication. Evidently, if surgical treatment is so often indicated, it is because the late results of medical treatment are not ordinarily brilliant.

Monprofit, Angers. In a number of cases, for purely social reasons, it is impossible long to continue medical treatment. When, in patients suffering from gastric ulcer, the accidents re-appear, after each fatigue, after each dietetic error, one intervenes surgically and can but be thankful for having operated. In perforation, in abscess, and in stenosis, we all agree that operative treatment is the treatment. In hemorrhages, we must distinguish between the abundant hemorrhage for which surgical intervention is so grave that it must not be attempted, and the small and repeated hemorrhages that are benefited in a surprising way by operation.

As to the late results of gastro-enterostomy, one must distinguish between the accidents reported by Parmentier and Denechau. Some of these accidents are characterized by dyspeptic symptoms, with vomiting of food. They are due to an operative mistake, to an obstruction of the gastro-intestinal mouth. I have assured myself of this in a few cases and a new intervention secured complete relief from the symptoms. The neuropath before the operation remains a neuropath after the operation; so I will insist, as Dr. Hartmann has, that we must beware of the nervous dyspepsias. I acknowledge that gastro-enterostomy is not suited to all cases; but I also emphasize that, when it is performed in judiciously selected cases, it gives excellent results. In cases of hyperchorrhydia, gastro-enterostomy may be followed by peptic ulcers.

Tuffier. I have attempted to study experimentally the pathological physiology of gastric ulcer. It is impossible, however, to obtain, in a dog, lesions analogous to the stomachic ulcer or to pyloric stenosis. I have noted that after the performance of a gastro-enterostomy in a dog, after ingestion of bismuth, the X-rays show that the stomach empties itself by the pylorus and not by the artificial gastric opening.

In the profuse hemorrhages of simple ulcer, it is better not to operate. The ulcer is difficult to locate, and the long operation, which its search would necessitate, is contra-indicated by the serious condition of the patient

As to the repeated hemorrhages, they are usually associated with other accidents, which accidents of themselves call for operation. In the presence of gastric adhesions, we must not be too hasty about operating. Stenoses command intervention, even if they be moderate in degree. Pyloric ulcer, owing to the frequency with which it determines stenosis, is a frequent indication for operation. Resection of the ulcer has only one argument in its favor, the possibility of secondary cancerization. Ablation must be made, if it be easily practicable. This facility of execution is a condition which we do not often meet, and therefore, gastro-enterostomy is the operation most frequently performed. It always secures a marked improvement and sometimes cures. It is evident that it can not give equally good results in all the different cases.

Bourget, Orne. Even in the presence of hemorrhage, the stomach can be washed. Washing with water, to which is added tincture of chloride of iron, gives excellent results. The question of milk diet is delicate. The milk alone becomes acid one hour and a half after its ingestion. If boiled, the acid is less marked. By the use of alkalies, we should aim to correct the gastric secretion more than to suppress it.

Bard. Gastric ulcer frequently heals spontaneously. This is proven by the frequency with which healed ulcers are noted at autopsy.

EXOPHTHALMIC GOITRE

The Etiology and Treatment of Exophthalmic Goitre. Ballet et Delherm, Paris.

The most diverse theories have been advanced as to the cause of Graves' disease. Some consider this disease a neurosis; others, as a consequence of some disturbance of the bulb, either functional or organic; others, as the result of a disturbance of the sympathetic system, and still others look upon this disease as a disease of the thyroid gland. Different treatments are the result of one or more of these etiological conceptions. Among the various surgical treatments, we will mention: (1) injections of medicinal agents into the thyroid body; (2) exothyropexy (this operation has been almost completely abandoned); (3) partial thyroidectomy; (4) ligation of the thyroidal arteries; (5) sympathicectomy.

Since Reverdin, Schiff, Julliard and Kocher drew attention to the serious consequences of total thyroidectomy, that operation is no longer performed, but partial thyroidectomy is performed in its stead. Depending upon the profuse or nodular character of the goiter, either ablation of one lobe or enucleation of the nodules is performed. The authors claim that this operation is not beneficial, and that it entails danger of immediate death, of alarming hemorrhages, and of respiratory accidents. They state that there is no case reported where von Graef's sign disappeared after operation. (This is an error, as the ocular symptoms disappear even if the exophthalmus persists.) They say that in 200 or 300 cases of thyroidectomy, performed for exophthalmic goitre, in only 3 or 4 did the partial exophthalmus disappear. They claim, as late results of partial thyroidectomy, such complications as myxœdema, insanity, and intellectual disturbances may occur. They conclude that partial thyroidectomy is more dangerous than the disease. (We would suggest to the authors that they read an article published by us in Surgery, Gynecology and Obstetrics, December, 1907, and they will there see that their statements are not justified by actual facts.) Ligation of the thyroidal arteries. This operation has been performed by Billroth, by Woelfler, Rydygier, and especially by Kocher, on exophthalmic goitre. According to Kocher, the symptoms of this disease are positively due to a hyper-activity of the thyroid body, and in lessening the secretion of this gland one can cure the disease. To avoid the serious consequences of a too complete thyroidectomy, Kocher performs successive interventions at different sittings, performing the successive operations only when he has been able to estimate the results of the previous ones. Some of the surgeons, as Lavisé, ligate the four vessels at one sitting, but as the ligation of the four vessels has been followed by myxœdema, it is better not to practice it. Ligation of the four vessels does not prevent recurrence of the disease.

Sympatheticectomy was practiced in 1896 by Jaboulay; he divided the cervical sympathetic trunks. Jonnesco, a few months after Jaboulay's operation, thinking that simple division was insufficient, resected the superior and middle cervical ganglion with the intermediary portion of the chord. In 1897, Soulié included in his intervention, the resection of the inferior cervical ganglion. The results obtained are inconstant. Complete cures are few, and in some of the cases there has been only an attenuation, more or less marked, of the symptom. Often, at the end of a few months, the symptoms reappear. Operations on the sympathetic are no longer in vogue. Other methods of treatment are: organic therapy, sero-therapy, X-ray therapy, radium therapy. These measures

are employed solely to modify the thyroid body or the sympathetic nervous system. Among the pharmaceutical preparations, salicylate of soda seems to be the most active agent. For the sake of completeness, we should mention hydro-therapy, massage, well adapted regimen, isolation, and psychotherapy.

DOYEN, Paris. In exophthalmic goitre, there is always in some part of the thyroid one or more structurally altered foci. Histologically, changes in the epithelium, in type and in amount, can be demonstrated. Extirpation of the diseased parts of the gland results in an improvement of symptoms, which improvement becomes manifest in five, six, or eight days. In many cases a definite cure is obtained. The operation must be performed rapidly as follows:

I use a transverse incision of the skin, which leaves a barely visible and an easily concealed scar; if there be nodules, I enucleate; if the enlargement is diffuse, I remove all the gland outside of a mass the size of a French walnut. This operation can be performed in from five to six minutes, and gives excellent results. It is the action of the gland that we want to modify, much more than that of the sympathetic system.

Medical treatment gives no results in exophthalmic goitre. I have many cases of exophthalmic goitre in which I have successfully performed partial thyroidectomy. I am satisfied with this operation; when properly performed, it has few dangers and it gives excellent results.

LANCREAUX, Paris. To me, quinine sulphate, in large doses and long continued, is the most serviceable medicinal agent that we possess in the treatment of exophthalmic goitre.

M. S. BALLET. I admit that, at the beginning of Basedow's disease, there is a nervous disturbance interfering with the function of the thyroid body. I must, however, acknowledge that the symptoms of this disease can be determined by the ingestion of thyroid gland, or of its various preparations. Practically, however, we must admit that some of these patients recover spontaneously, and some recover under medicinal treatment. Cases of exophthalmic goitre should be sent to the surgeon only when no improvement follows the employment of proper medicinal measures, and also belonging to the surgeon are those cases associated with grave disturbances.

LEOPOLD LEVI, Paris. Basedow's disease can be produced in men by the ingestion of thyroid gland preparations, and also by iodine treatment of simple goitres.

KOCHER, Bern. I have observed, in exophthalmic goitres, some blood changes and some changes in the lymphoid tissue, that were due to the thyroid disturbance. I have had good results by partial extirpation and by arterial ligation. I have at times performed only one of these operations; at other times I have performed them both, either at one or at successive sittings, in the same case. I am an advocate of operative treatment of this disease.

RÉNON, Paris. I have used pituitary body extract in exopthalmic goitre. I consider it only a symptomatic medication. I have used it to influence the vascular symptoms of exophthalmic goitre.

PARISOT, Paris. I have treated by pituitary body extract, three patients suffering from exophthalmic goitre. In all cases I have had improvement in all the symptoms. I think that we must consider two things; the intense vaso constriction which this hypophyseal extract exerts upon the thyroid vessels, and second, the antitoxic influence of this extract towards thyroid extract.

PAUL SAINTON, Paris. I wish to talk of organotherapy of exophthalmic goitre, its indications and its results. For a long while, exophthalmic goitre was considered a neurosis, pure and simple, the same as neurasthenia, as hysteria. The cause of this affection has also been sought in the sympathetic nervous system, either in its entirety or in its cervical portion. Others have sought the cause in the restiform bodies. It seems, however, that the thyroid theory has gained and is still gaining ground. Some authors have sought to find the cause of exophthalmic goitre in other glands but the thyroid proper. Some, having seen the presence of Basedow's symptom-complex accompanying changes in the ovarian function, such as puberty, menstrual disturbances, etc., have looked upon the ovaries as being the seat of the cause of this disease. Others, having noticed at autopsies of patients dying from this disease the persistence and enlargement of the thymus gland, have looked upon this organ as being the cause of this infection. Some have thought that it was due to the pituitary body; some to the parathyroid bodies. There have been so many cases in which organic therapy has been employed, and there have been so many improvements following its use, that the effects surely are not due to suggestion. However, the problem is still undecided.

We have, as yet, no specific treatment for this disease: therefore hygienic, dietetic, electrotherapic methods of treatment that have given successes should not be entirely abandoned.

MISCELLANEOUS

The Etiology of Cancer of the Stomach in Man and in Animals. Doyen.

Experiments undertaken to solve the etiology of tumors have been conducted along two distinct channels. First, as to transplantation of the cancer. Ehrlich has shown that the epithelioma of mice, after passing through many successive animals, can be converted into a sarcoma. He has shown that these mice upon whom he was unable to transplant eptheliomata, were vaccinated, or immune against epithelioma, against sarcoma, and against enchondroma. More recently, he has shown the transformation of epithelial cancers into adenomata; that is, by inoculating mice with a malignant tumor he obtained a benign tumor. Researches upon the pathogenic causes of tumors have led me to believe that most varieties of tumors,— epitheliomata, carcinomata, sarcomata, enchondromata, etc.,— contain the same microbe. Experiments have shown that the inoculation of pure cultures, either of epithelial or sarcomatous origin, produce indifferently, and almost always simultaneously, in the white rat, epithelial and cartilaginous neoplasms in the lungs, identical with the malignant enchondromata that are found in dogs' lungs. The experiments of Ehrlich have confirmed fully my early publications: 1. Upon the etiological unity of neoplasms; 2. Upon the possibility of immunizing the organism by a unique vaccine against all tumors, no matter how structurally different they may be. This vaccine treatment can be successful only if it be employed upon first appearance of the symptoms.

Injuries and Disease of the Liver and Gall-bladder. Borszeky.

Open Wounds of the Liver. In the first case reported, there was a gunshot wound of the liver with an associated perforation of the stomach. The stomach wound was sutured; uneventful recovery followed.

In the second case, there was a stab wound of the liver, with an associated one of the stomach, of the pancreas, and of the renal vein. Death followed, despite the suturing of the liver, of the stomach, and the tamponing of the pancreatic wound. Borszeky advises early intervention in all penetrating wounds of the abdomen. In wounds of the liver, he advises deep sutures. Tamponing is only a measure of necessity and the ingestion of gelatinized serum is of doubtful value. As to the nature of the suturing agent, it has but little influence upon cure. In the case reported above, catgut was employed.

Traumatic Rupture of the Hepatic Duct. Hilderbrandt.

The author reports a case of a young girl, five years old, run over by a wagon. There was laceration of the hepatic duct. Diagnosis was determined by the presence of distension of the abdomen and the absence of biliary pigments in the urine. The hepatic duct was drained and cure was rapid. In a case reported by the author, though the bile was sterile, there was produced an aseptic fibrous peritonitis depending upon the corrosive action of the bile. The author states that no case of septic peritonitis, due to rupture of the biliary ducts has yet been reported.

In all these cases operation must be early.

One Hundred Operations upon the Biliary Ducts and Their Late Results. Kocher and Matté.

Kocher says it is often difficult to determine, previous to operation, the exact seat of the pathological lesion. In all these cases, he used an oblique incision. It saves the nerves of the rectus abdominus muscle and gives sufficient room.

Ideal cholecystotomy, with closure of the gall-bladder by suture, was practiced 31 times, but only in those cases where the gall-bladder showed no inflammatory adhesions, and in which Kocher was sure that all the gall-stones had been removed. The gall-bladder in these cases was sutured in two layers, one layer of catgut, including all the coats of the gall-bladder and an external layer of silk sutures. Then the abdomen was closed. Cholecystectomy was performed in 30 cases, several times after the gall-bladder has been opened, the abdominal cavity being closed without drainage in nineteen cases. For choledochotomy, retro- or trans-duodenal, Kocher recommends the mobilization of the duodenum. This facilitates the intervention, and never has any disadvantages.

His mortality was 2- per cent. In cases that were drained, the tampon was removed two or three days after the operation. Sixty-nine out of 82 patients were completely cured of their biliary colics. Six have died since, but of a disease totally independent of cholelithiasis, and in only two cases did a post-operative hernia develop. Cholelithiasis recurred three times in 31 ideal cholecystostomies; once in 19 cholecystostomies; and also once in 30 cholecystectomies. Cholecystectomy, in his cases, did not unfavorably influence the digestive functions. -

Aimé Paul Heinecke.

Report on 300 Tumors of the Bladder.

A. v. Frisch details 300 operations for tumor of the urinary bladder. Of this series of cases, 201 were so-called benign papillomata; yet it is interesting to note that a study of serial sections of these 201 benign papillomata disclosed malignant degeneration in over one-half the cases. As a matter of fact, therefore, two-thirds of all the tumors in this series of 300 were malignant. Based on this fact, Frisch recommends that a portion of the bladder mucosa should be removed, even in those cases of well pedunculated tumors. Should the tumor not be pedunculated, then a wide excision of the entire thickness of the bladder wall is recommended. Frisch in his operations has always confined himself to the simple suprapubic operation. Frisch closes the bladder wound with catgut and after partially closing the suprapubic wound, drains through the remaining aperture. He advises against complete closure of the bladder, admitting, however, that such a procedure might be considered rational if the urine be absolutely normal. The mortality of the series of 300 cases was 14 per cent for the papillomata and 25 per cent for the carcinomata — *Wien. Klin. Woch.*, No. 40, 1907. M. G. Seelig.

Tuberculous Splenic Cirrhosis. Splenectomy. By X. Delore et Gabourd.

Many operators believe with Quénu and Duval that in Banti's disease, we have an indication for splenectomy. Three splenectomies in the hands of the authors, gave three operative cures.

In hydatid cysts of the spleen, splenectomy ordinarily is preferable to marsupialization, especially if the spleen be studded with cysts. Cases are cited in support.

In one of the cases reported by the author, the cirrhosis of the spleen was associated with a bacillary tuberculous peritonitis. Upon the peritoneum, the tuberculous nature of the lesions was microscopically demonstrated, sections from the spleen, however, showed only hypertrophic cirrhosis, no microscopical suggestion of tuberculosis being present.

In cases of mobile spleen, we think the median-abdominal incision is the best. If the spleen be markedly adherent, an oblique incision, parallel to the lower border of the thoracic cage, to which a vertical incision can if necessary be added, seems the method of choice. In these cases, if the separation of numerous adhesions necessitates drainage, we use a lumbar drain. In some cases where the spleen is solidly fixed to the concavity of the diaphragm, the resection of the inferior border of the thorax facilitates the removal of the spleen.— *Cirrhose hypertrophique tuberculeuse de la rate. Splenectomie. Archives générales de Chirurgie.* 25 janvier, 1908.

On the Pathogenesis of Cholelithiasis.

Exner and Heyroosky, by inoculating with various kinds of bacteria, bouillon in which was dissolved sodium tanrocholate and glycocholate, determined that there was a decomposition of the biliary salts. Of these bacteria, (streptococcus, staphylococcus aureus, Friedlander's bacillus, bact. coli.—bac. pyocaneus, bac. proteus, typhoid bacillus) although all decomposed the biliary salts, by far the most active was the typhoid bacillus. From these experiments, they conclude certain bacteria precipitate the biliary constituents and bring about the formation of gall-stones. They also conclude that because of the slight destructive action, the streptococcus plays no rôle in the etiology of gall-stone formation.— *Wien. klin. Wchnschr.*, 1908. Feb. 13.

C. G. Grulee.

Goitres and Strumitis. By Xavier Delore and Andrè Chalier.

These authors report and analyze 73 cases of operatively treated benign enlargements of the thyroid gland, inflammatory or neoplastic in nature. They have not considered primary exophthalmic goitres, nor malignant tumors of the thyroid gland, nor any form of goitre that proved amenable to medicinal measures. They had one death.

Most of their simple goitres occurred in female patients. In nearly half of the cystic goitres, the cyst contents contained blood elements or their derivatives. In some of these cases the intracystic hemorrhage is acute, producing a marked increase in the volume of the cyst, and the rapid appearance of functional disturbances. The cyst walls show no special anatomical changes. More commonly, however, the effusion occurs gradually; as in pachy-vaginalitis, we are dealing here with a torpid inflammatory process, causing a proliferation and thickening of the cyst wall, and the production of an hemorrhagic exudate. The intracystic fluid in these cases is characteristic, having a blackish aspect and chocolate hue. The cases belonging to the first type may be called acute thyroidal hæmatoceles; those belonging to the second type, sub-acute or chronic thyroidal hæmatoceles. These thyroidal hæmatoceles may cause compression disturbances, may become the seat of infection, of suppuration. Cases are reported to show that psychical disturbances, even insanity as well as the symptom-complex of Basedow's disease, can develop in the course of the existence of simple goitre. The correlation of these morbid

phenomena to thyroid changes is demonstrated by the fact that they are either improved or completely cured by operative treatment of the goitre.

The existence of diver goitre, a goitre which is very movable and situated either below or above the sternal notch, depending upon the motions of respiration, must be kept in mind. Of these there are two forms, the cervical and the intrathoracic. The latter are difficult to diagnose and difficult to operate. Nevertheless their diagnosis is important, as the disturbances to which intrathoracic goitres give origin can be completely controlled by the removal of the goitre. A case in point is reported. A painter remained for a long time in the medical ward for œdema of both lower limbs associated with dyspnæa and albuminuria. The diagnosis of lead nephritis was made. Only when symptoms of unilateral paralysis of the recurrent laryngeal nerve became manifest was the diagnosis of intra-thoracic goitre made. The patient was 61 years of age and in bad physical condition. Nevertheless, it was decided to operate, and the goitre was removed. Shortly after the œdema, the albuminuria, and the symptoms referable to the recurrent laryngeal nerve disappeared. Cardiac disturbances are frequently engendered by this form of goitre.

Operate: *a*. In all cases where the goitre by compressing neighboring organs interferes with the normal function of organs; be the goitre large or small, retrosternal, or fibrous, or cystic.

b. In all cases in which the goitre causes nervous or psychical disturbances.

c. Even if the goitre does not cause compression disturbances, these authors favor operative intervention. The operation of the removal of the goitre is benign; it prevents the possible development of hemorrhages and inflammation in the goitre, as well as malignant or cancerous degeneration of the same. In children and in adolescents, before resorting to surgical treatment, medical measures (iodothyrine, iodized applications, etc.) must be tried.

The injection treatment of goitre is condemned. Exothyopexy can be of service as an emergency operation. To resection or partial thyroidectomy, they prefer enucleation, either massive or intraglandular. It is an inter-capsular operation and avoids the infliction of injury to the recurrent laryngeal nerves, or to the large thyroidal vessels. Socin's operation is of service in adenomata.

Kocher's transverse incision is the one they most always use. The infra-hyoid muscles are separated when possible. If, of necessity, they must be divided, suture them at the close of the operation.

Always employ drainage. It prevents the development of hæmatomata, and often the development of infection. It prevents the accumulation of thyroid secretion in the wound. This secretion can, if absorbed, cause very alarming and at times fatal accidents.

Local or general anæsthesia may be used, the choice being determined by the same rules that influence the choice of anæsthetic agents in other operations. They personally prefer ether preceded by ethylchloride (10 cc.).

Twelve cases of thyroiditis and strumitis are reported. The authors state that suppurative inflammation occurs more frequently in goitres than in the normal thyroid gland. They treat these cases by a free incision associated with drainage. In some cases, they remove the wall of the abscess. All their cases recovered.—*Contribution a la Chirurgie thyroidienne Goîtres et strumites. Revue de Chirurgie*, Paris, vol. xxvii, Oct 10, 1907. AMIÉ PAUL HEINECK

PRIMARY CARCINOMA OF THE BLADDER. By Benjamin H. Brown, M.D., Chicago.

The author in this communication reports a series of ten cases of primary carcinoma of the bladder from the records and specimens in the pathological laboratory of the Rush Medical College. The report is based primarily upon postmortem examinations, supplemented in each case by a careful microscopic examination, and as far as possible, by the clinical data.

In regard to the prevailing seat of the tumors, statistics concerning which the author finds very contradictory, it was definitely determined in this series that in three instances the primary seat was in the trigone. In three other cases the tumors showed greatest involvement of the upper part of the bladder, while the remainder affected the middle zone more extensively. The urethra was directly involved in the tumor mass in two instances, while in two there was partial obstruction by projection portions of the neoplasma. One or both ureteral orifices were directly implicated in three cases, while in four others there was partial obstruction by pressure of the tumor or nodules. One tumor had invaded both seminal vesicles. None of the growths had extended to the prostate or rectum, and only one had caused perforation into the peritoneal cavity.

In three cases of the series no metastases or extravesical involvement was found, while in six others metastases were present in various organs, as follows: Four times each in the retroperitoneal glands and lungs; twice in bones, and once each in the peribronchial glands, inguinal glands, adrenal glands, kidney and testicle.

From this study the following conclusions are drawn by the author:

1. Intelligent deductions and trustworthy statistics are to be derived only from careful and thorough study of a large number of cases from both clinical and anatomical sides. 2. The most frequent seat of carcinoma in the bladder and the direction of extension are still debatable questions. 3. Metastasis is much more frequent than is conceded by many clinicians. 4. A malignant growth in the bones may occur from a primary carcinoma of the urinary bladder. 5. The most frequent cause of death in vesical carcinoma is a secondary infection of the ascending urinary tract. 6. The diagnosis is always difficult, especially after the onset of complications.— *American Jour. Med. Sciences*, vol. 134, 1907. GEORGE E. BEILBY.

RUPTURE OF THE KIDNEY, WITH REMARKS UPON CONSERVATIVE OPERATIVE TREATMENT. By Thomas R. Nelson, M.D.

Nelson in this contribution places upon record four cases of sub-parietal injury of the kidney which he treated by conservative measures, and considers the question of the employment of such means rather than the radical one of nephrectomy, when possible, in the treatment of this class of injuries. The author's treatment consisted in lumbar incision and gauze tamponade of the lacerated kidney. In two of the cases, with laceration of the peritoneum and severe hemorrhage into the abdominal cavity, laparotomy was also required. Of the four cases treated, three recovered and one died of secondary hemorrhage after removal of the gauze.

The author reviews the literature of the subject of renal injuries with the object in view of ascertaining the results of surgical treatment of rupture of the kidney by packing drainage, or suture of the renal wound, as compared with those of nephrectomy, and of determining the limitations within which conservative treatment may properly be employed.

While it is obvious that comparative statistics may be deceptive, since the results of injuries vary so in extent, yet it seems certain from the author's collected cases that conservative measures should be employed where the hemorrhage can thus be controlled, and where the vitality of the kidney is not threatened beyond reasonable hope. — *American Journal of the Medical Sciences*, vol. 135, 1908. GEORGE E. BEILBY.

OBSERVATION ON SIX CASES OF ACUTE PERFORATING ULCER OF THE DUODENUM. By E. A. Codman, M.D.

The experience of the author with this condition has led him to the conclusion that it is of far more frequent occurrence than is usually considered. This is due to the fact that cases of acute perforating ulcer so closely simulate appendicitis that they usually come to operation with this diagnosis, and unless the condition of the appendix is carefully investigated, the postoperative diagnosis is not revised. The peritonitis following the duodenal perforation, involves often the appendix and the latter is removed under the erroneous impression that it was the primary seat of the infection. He emphasizes the importance of examining carefully the mucosa as well as the peritoneal coat of the appendix on its removal, unless perforation or gangrene is obvious. He cites several points which in severe cases would suggest duodenal ulcer rather than appendicitis:

1. Onset of pain more sudden and violent and more initial shock.

2. A contracted concave, boardlike abdomen. This he believes very characteristic though some cases of appendicitis have it too.

3. Tympany over the normal area of liver dullness. This is by no means the rule, but when present is almost diagnostic. Gas may not always be noticed when the peritoneum is opened.

4. The vague symptoms of duodenal ulcer elicited by careful questioning.

5. Most of the patients are males between twenty and forty years.

6. Location of pain and tenderness is very deceptive. The technique of dealing with these cases is discussed fully.— *Boston Medical and Surgical Jour.*, vol. 158, Feb. 13, 1908

GEORGE E. BEILBY.

THE TREATMENT OF ACUTE INFECTIONS (PURULENT) BY MEANS OF STASIS HYPERÆMIA.

L. Wrede, who is an assistant of Professor Lexer, offers the most painstaking and carefully studied brief against Bier's hyperæmia. He does not assume that stasis hyperæmia has no place in surgical therapy, but takes the ground that many of Professor Bier's statements are not corroborated by facts; and furthermore, that, under certain conditions, the induction of hyperæmia may work harm for the patient.

The paper starts off with a theoretical discussion of Bier's theory. Wrede objects to the autocratic statement that venous congestion and a slow blood stream are, of necessity, Nature's means of combating acute infections. Clinical experience has not yet definitely proved that stasis hyperæmia possesses either a bactericidal power or the power of diminishing the virulence of bacteria. Moreover, Wrede contends that Bier's method causes a

rapid absorption of toxic material, which not seldom results in deleterious action on the viscera. Bier's teaching that small incisions are better than than large ones is little short of heresy, according to Wrede; and Bier s explanation that "stasis hyperæmia accomplishes good results by means of hyperæmia" is little short of foolish.

From a practical point of view, Bier's method is of service only in cases of very mild infection, and in these cases, as a matter of fact, cures can be accomplished just as readily by methods in common use before Bier's time. Some patients with severe infections have fared so badly under the use of hyperæmia that major amputations, and even death have resulted, due to a generalized sepsis. All in all, Wrede thinks that Bier's fundamental theory that "inflammation is a useful process" is falsely conceived.

The article is, covertly, too polemic in character to be of unquestioned scientific value, and yet it stands as the most serious attempt to controvert the work of Bier and his school.— *Arch. f. Klin. Chir.*, b. lxxxiv, h. 2, and 3.

M. G. Seelig.

A Clinical-Experimental Study of the Question of Acute Dilatation of the Stomach. By W. Braun and H. Seidel.

Concerning the origin of acute stomach dilatation, which occurs especially after laparotomies, the authors recognize the fact that there is great difference of opinion. Three modes of origin are recognized. 1. Closure of the cardia by a valve-like formation at the entrance of œsophagus into stomach. 2. Injury to the duodenum by descent of the small intestine into the pelvis, thus producing traction on the mesentary that passes over the duodenum: *An artero-mesenteric obstruction.* 3. Through central nervous influences.

Autopsies as well as experiments on live dogs, the personal observations of the authors and a critical study of the literature led these investigators to the conclusion that not mechanical but purely functional disturbances of the stomach play the leading rôle in the etiology of acute stomach dilatation. In part these disturbances of the stomach innervation are central, peripheral, or reflex in their nature; in part they are disturbances of the musculature itself. The acceptance of innervation disturbances as the etiologic factor explains the acute dilatation after anæsthetics, laparotomy, hernia and other injuries, spinal cord injuries, peritoneal infections, constitutional and other diseases. Direct injuries to the muscular fibres come through mechanical, inflammatory or toxic injuries of the same, perhaps on account of a primary weakness, brought on by overdistention, peritonitis, toxæmia or gastric fermentation. In consequence of the disturbed gastric movements, there is soon an accumulation of ingested food and gastric secretion; then decomposition sets in and the stomach becomes acutely dilated.

The author's experiments on dogs were performed after the establishment of gastric fistula. As a measure of the effect which the experiments had on the emptying mechanism of the stomach, the animals were made to vomit under various stimuli, e. g., by blowing air into stomach through the fistula, by the administration of tartar emetic or apomorphine. The experiments demonstrated that narcosis, as well as division of the vagi, the splanchnic, the sympathetic or the upper part of the spinal cord, prohibited the stomach from emptying itself through vomiting.

Finally, the authors discuss the clinical picture of the disease and the course of acute dilatation of the stomach in man. Washing out the stomach they believe to be the most important measure both in the prevention and relief of the condition, while operation, gastroenterostomy or jejunostomy, should very seldom be considered.— *Mitteilungen aus den Grenzgebeiten der Medizin n. Chirurgie*, bd. xvii, h. 5.

George E. Beilby.

Value of the Differential Leucocyte, Count in Acute Appendicitis. By Alfred H. Noehren, M.D.

Data on 72 cases of appendicitis revealed the fact that differential count of leucocyte may be of great value to the surgeon. Ninty per cent of polynuclears indicate immediate operation. The lower the per cent of polynuclear cells the less severe is the condition. The degree of leucocytosis is too variable to be of practical value.— *Annals of Surgery*, February, 1908.

Wm. R. Cubbins.

Postoperative X-ray Treatment of Malignant Disease. By. Russel H. Boggs, M.D.

X-ray treatment was found to be very beneficial when applied properly. The glands undergo fibrous change. More favorable results are obtained in carcinoma than in sarcoma, on account of the difficulty in determining its virulency.— *Annals of Surgery*, February 1, 1908.

Wm. R. Cubbins.

Considerations on the Etiology and Origin of Hernias. By P. Berger.

From the medico-legal standpoint, the question of hernia is most complex. Many hernias which are said to be due to an effort, to a strain, are in

reality hernias due to weakness dependent on a congenital malformation. (P. Brouardel).

An individual bearing a hernia due to an accident, must either be provided with a truss or subjected early to an operation for radical cure. If he be provided with a truss, incapacity for work ceases and consolidation must be considered as acquired after the hernia has been contained and is maintained by bandage deemed sufficient.

If the operation for radical cure be performed, consolidation must be dated from the time when the patient can, without undue caution, resume his calling. That is usually three months after the operation. It is needless to say that if the operation for radical cure has been well performed, especially if it has been performed for a recent hernia, no bandage or appartus must be worn after the union of the operative wound is complete.

Thus, in a hernia occurring during work, consolidation of the wound must be dated from the time the subject of the hernia has been provided with a well-fitting truss. After an operation for radical cure, the consolidation of the hernia must be dated three months after the date of operation. It takes, however, from eight to ten months more to be able to judge of the distal results of the operation and of the validity of the cure obtained by the latter.— *Les hernias et les accidents du travail. Considérations sur l'etiologie et sur les origines des hernies. Revue de chirurgie,* 1906.

Doménichini (Clinica chirurgica, août 1907) is of the opinion that once a workman has been operated upon for an inguinal hernia, he is entitled to no further indemnity.

Causes of Recurrence After Radical Cure of Inguinal Hernias. Femoral Hernias Developing After the Cure of an Inguinal Hernia. By P. Berger.

Among the causes of recurrence may be mentioned defective technique. In a good operation for radical cure, the anterior wall of the inguinal canal must be widely opened. There must be a high resection of the hernial sac. All omentum present in the hernial sac must have been removed. The posterior wall of the inguinal canal must be rebuilt and its normal obliquity restored. The removal of masses of adipose tissue and of varicose spermatic veins is a valuable step. In rebuilding of the posterior wall, the sutures must be so united as to secure good approximation of the lower order of interior obliquity of the transversalis muscle in order to shorten Poupart's ligament.

Cure is difficult in large hernias, due to the gliding down of the large intestines. In Bassini's operation, Poupart's ligament is elevated. From that elevation of Poupart's ligament results an enlargement at times of the crural canal. This is especially liable to occur if there be weak abdominal walls. It is well to avoid this elevation of Poupart's ligament. It is better in these cases to lower and suture a portion of the rectus abdominis muscle to Poupart's ligament; or, to suture first Poupart's ligament to Cooper's ligament and then to perform a radical cure for hernia and follow this by covering the whole with a portion of the pectineus adductor muscle.— *Les causes de récidives á la suite de la cure radicale des hernies inguinales. Hernies crurales qui se développent à la suite de la guerison d'une hernie inguinale. Bulletin médical, 7 décembre,* 1907.

Intercostal Abdominal Hernia. By P. Alquier.

Intercostal abdominal hernia is an uncommon affection. It is always of traumatic origin. It always occurs on the left side of the body, and at the level of the 6th, 7th, 8th, 9th, and 10th intercostal spaces. It usually occupies the anterior extremity of these spaces. Though it usually does not involve the pleural cul-de-sac, an abdominal intercostal hernia may under certain conditions develop through the pleural cul-de-sac. These hernias do not possess a sac. Their contents are frequently adherent to the deep layers of the skin. Clinically, we have the signs common to all hernias, and pain and digestive disturbances may be very marked. Its infrequency may cause its oversight. Radiography may be of much usefulness in determining the contents of the hernia and in fixing its relation to the pleural cul-de-sac. The operation may be difficult owing to adhesions of the hernial contents, owing to the narrowness of the operative field and to difficulties which may be associated with the parietal orifices.— *Hernie intercostale abdominale. Archives générales de Chirurgie,* 25 janvier, 1908.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF GYNECOLOGY

UNDER THE CHARGE OF

J. Clarence Webster, M. D. — E. C. Dudley, M. D.
J. C. Hollister, M. D. — F. W. Lynch, M. D.
Gerry R. Holden, M. D. — Carey Culbertson, M. D.

The Round Ligament in Femoral Hernias. By Chevrier.

The round ligament is frequently in contact with the sac of the femoral hernia. Anatomically it is just behind the secondary depression. If it is not seen during the course of the operation, it is because in the dissection of the sac it is pushed aside. In the ordinary femoral hernias, the round ligament may occupy three different situations: It may be adherent to the peritoneum, posterior to the sac; second, it may be detached from the peritoneum and adherent to the top surface of the neck of the sac, and may be temporarily adherent; third, it may pass over the fundus of the sac and determine the strangulation of the fatty tissues which surround the sac.

The prolapse of the round ligament is an etiological factor in the production of femoral hernias containing any of the internal genitalia. The most common content of these congenital crural hernias is either a portion or a whole of the Fallopian tube. — *Le ligament rond dans les hernies crurales. Revue de chirurgie*, février, 1907.

Aimé Paul Heinecke.

Postoperative Occlusions. By J. L. David.

The existence of intestinal occlusion, due to spasm is yet to be demonstrated. As to the paralytic form of intestinal occlusion, it is not possible for us to separate it from the peritonitis which accompanies it. The phenomena of postoperative intestinal paralysis, we believe, are always due to peritoneal infection, grave or severe; excluding the above as well as the postoperative intestinal occlusions due to some operative error, postoperative occlusions can be classified into three groups: 1. Occlusion of bands. 2. Occlusion by adhesions, and 3. Occlusions due to vicious position.

There is one cause of intestinal occlusion, due to vicious position, which has not been very much studied. That cause is the Trendelenburg position. Its mechanism is easy to understand.

The change from the inverted reclining posture, in which the transverse colon and the coils of the small intestine have gravitated towards the diaphragm, to the horizontal posture, suffices in certain cases to produce a twist or an angulation of the intestine. Kraske has reported two such cases; but more frequently another factor intervenes — it is intestinal decompression, it is abdominal vacuity.

After the ablation of a large tumor,— of an ovarian cyst, for instance,— the intestine is too free in the abdominal cavity and easily displaces itself. These movements of exaggerated amplitude may lead to torsion, to angulation.

It is difficult early to diagnose these postoperative occlusions, because their development is so insidious and because they are masked by the inhibitory phenomena which we are accustomed to witness after laparotomies. The repeated vomiting is attributed to the anæsthetic. The abdominal pain is attributed to the hypersensitiveness of the patient. One hesitates, time flies, and it is soon too late and one regrets not having taken a bold decision while the patient could still be saved.

Preventive measures must not be ignored. Denuded surfaces must be covered with peritoneum; stumps must be buried; and inflamed portions of the omentum must be resected. The patient must be returned to the horizontal position before beginning the suturing of the abdominal walls. Satisfy yourself that the intestinal coils are in a good position before completely closing the abdominal wound.— *Occlusions post-opératoires. Tribune médicale, Archive générale de Chirurgie*, janvier, 1908.

Intestinal Occlusion: Cause and Mechanism of Accidents. By Roger.

Of the various theories advanced to explain the accidents secondary to intestinal occlusion, the three that most deserve to be kept in mind are, the nervous theory, the toxic theory, and the infectious

theory. They, however, do not sufficiently explain the observed phenomena.

Basing his opinions upon experimental researches, Roger claims that the accidents of intestinal occlusions are due to an auto-intoxication of the organism. The intestinal contents, in fact, are toxic and their toxity is due to the glandular secretions of the digestive system. If an obstacle determines the stagnation of the intestinal contents, that of itself causes a disturbance or an arrest of secretory activity of the various glands; for instance, of the intestinal, of the hepatic and of the pancreatic glands, the products of which are emptied into the upper portion of the digestive tube. Most of the secretory liquids are emptied into the upper portion of the digestive tube, and herein lies the explanation of the fact that the accidents are more early and more serious the higher the seat of intestinal obstruction. If the seat of obstruction be in the lower part of the small intestine or in the large intestine, death is notably retarded.

Roger has determined also, that the extracts prepared from the intestinal coats are toxic, convulsant and hypotensive. He claims that there is a syndrome of gastro-intestinal insufficiency just as there is a syndrome of hepatic insufficiency (grave icterus), a syndrome of renal insufficiency (uremia) a syndrome of thyroid insufficiency and one of adrenal insufficiency. Why refuse to the digestive tract that which we accord to other parts of the organism? — *L'occlusion intestinale cause et mécanisme des accidents. Revue scientifique*, janvier, 1907. AIME PAUL HEINECK.

ADVANCED BROAD-LIGAMENT PREGNANCY. By Ralph Waldo Lobenstine.

Rupture of the ectopic sac into the space between the layers of the broad ligament is rare, while advanced cases are very unusual. In typical cases the leaves of the broad ligament are stripped back so as to leave a sessile tumor. In other cases, a more or less pedunculated tumor may be formed. The placenta may occupy any portion of the wall of the sac. The sac may rupture into the peritoneal cavity at any time, thus forming a "secondary abdominal pregnancy."

Lobenstine reports one case of advanced broad-ligament pregnancy. When first seen the patient was in very bad condition, the clinical picture being more that of a large ovarian cyst, with beginning peritonitis than that of an ectopic gestation. There had been no menstrual period for 8½ months.

At operation, 24 hours later, it was found that the posterior layer of the left broad ligament had been stripped up and backwards by the pregnancy. There was a very large tumor formed. The placenta, which was in the bottom of the cavity behind the uterus, had become detached, causing free bleeding into the sac and death of the child. Ten quarts of bloody fluid was removed from the sac before the child was extracted. After removing child and placenta there was little oozing, but the patient was too seriously ill to survive the operation more than a few days.— *Bulletin of The Lying-In Hospital of the City of New York*, vol. iv, No. 2, 1907. GERRY R. HOLDEN.

TUMORS OF THE OVARY COMPLICATING PREGNANCY AND LABOR. By Ralph Waldo Lobenstine.

Lobenstine reviews the literature on the subject and then gives the histories of 9 cases which occurred in 42,000 labors at the Lying-In-Hospital, New York City. His conclusions as to treatment are as follows: In as much as the maternal mortality of cases during pregnancy ranges between 20 per cent and 25 per cent when no operation is performed as against 3 per cent to 5 per cent in operative cases, operation should always be done as soon as the diagnosis is made.

If the tumor does not descend into the pelvis during labor it requires no treatment at this time. If the tumor is found to lie in the pelvis at the time of labor, we should endeavor to push it up gently into the false pelvis. If this cannot be done and the child is alive, we may perform a vaginal ovariotomy with subsequent delivery of the child, or a Cæsarean section with ovariotomy, or an abdominal ovariotomy, with delivery "per vaginam." If, however, the tumor descends into the pelvis during labor and the child is dead, it may be possible to do a craniotomy and extraction. In some of these cases, however, ovariotomy must be first performed.

In case the tumor was not removed either during the pregnancy or labor, it is very likely to give trouble in the early puerperium. Therefore, operation soon after delivery is indicated in such cases.— *Bulletin of The Lying-in Hospital of the City of New York*, vol. iv, No. 2, September, '07.
GERRY R. HOLDEN.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF OBSTETRICS

UNDER THE CHARGE OF

C. S. Bacon, M. D. — Rudolph W. Holmes, M. D.
C. v. Bachellé, M. D. — Hugo Ehrenfest, M. D.

The Etiology of Puerperal Retroflexions. By R. Olshausen.

Retroflexions occurring during the puerperium result invariably from a perimetritis or a parametritis; and, as a rule, they are the result of the puerperal changes in the genital organs. Olshausen believes that these retroflexions, generally if not always, occur in the first puerperium and not during the later ones; and indeed, this has been the case in his own experience. Curiously enough, one finds no mention of this fact in the literature. Its importance in the way of prophylaxis cannot be over estimated.

Küstner has said that puerperal retroflexion is very frequently followed, secondarily, by a pelvic peritonitis; but Olshausen can not entirely agree with this, for he believes it to be only a very occasional occurrence. The retroflexion occurring during the puerperium, unless complicated by an inflammatory process, is always mobile. However, the occurrence of para- or peri-metritis calls forth complications.

As to etiology, Küstner believes that the retroflexion had previouslv existed in the girl and that the uterus merely returned to the faulty position after the delivery. This theory Olshausen does not accept because of the frequency of the retroversion of the puerperium as compared with the comparative infrequency of the retroversion in the virgin. He believes the anatomical conditions, present in the later pregnancies, differ enough from the conditions in the first pregnancy to account for the position of the uterus. In the latter part of pregnancy, the head enters the inlet of the pelvis, projecting pretty well into the pelvic cavity and this results in a marked thinning of the cervix from the pressure and stretching, in fact so much so, that at this time one can easily palpate the sutures of the fetal skull through the cervical wall. Such a cervix easily forms folds in its walls during the puerpium. This condition does not recur in succeeding pregnancies. During the labor, the cervix is thinned still more and its canal often stretched to a length of 10 cm. It is this thinning and stretching of the cervical wall that he firmly believes is the most important factor in the production of these displacements. It is apparent that the anterior wall is subjected to the greatest amount of thinning and elongation; and, therefore, one would expect anteflexion to occur more easily and, as a matter of fact, it does. The development of a permanent abnormal anteflexion is prevented by the regular and repeated distension of the bladder.

Less frequently anteflexion does not occur but retroflexion appears. It is possible that the position of the patient on her back in bed during the puerperium favors the production of the malposition, or that over-distension of the bladder or intestines, which so often occurs, tends to displace the uterus. The fact remains that the malposition occurs very frequently during the first puerperium; and, therefore, it is the duty of the obstetrician, about four or five weeks post partum, to make a careful examination of his patient and bimanually to replace the uterus if retroflexed, repeated if necessary and if this is unavailing to have the patient wear a pessary for the time. In recent cases such treatment is very effectual. Occasionally the condition can be found as early as eight days after labor, especially in miscarriages, but usually the retroversion first appears in the third or fourth week of the puerperium.— *Zentralblatt f. Gyn.*, No. 1, 1908. *Zur Ätiologie der Retroflexio uteri Puerperalis.* C. v. Bachellé.

The Healing of Hebosteotomy Wounds. By Dr. Oberndorfer.

The hebosteotomy in the case reported occurred in a VIII para, aged 36, whose children had all been prematurely born or else were very small. In this instance the pregnancy was prolonged 3 to 4 weeks over term and hebosteotomy was done. and the patient delivered of a nine pound child. The puerperium was normal and uneventful, except for an hematoma of the right labium.

which attained the size of a hen's egg but which was rapidly absorbed. In three weeks the patient was able to be about, though limping somewhat. This, however, disappeared later on. At this time a sharp edged cleft, about 1 cm. wide, could be felt at the site of the bone incision; later this was scarcely perceptible. Fourteen months later, the woman died from an intercurrent affection and at autopsy, the pubic bone was removed and the site of the hebosteotomy was examined histologically, when it was found that there was no sign of ossification and only fibrous union had occurred, with cartilaginous edges. The literature, too, he believes, bears out his statement that in nearly all cases only fibrous union occurs; and this, he thinks, is due to the fact that the smooth sawcut does not favor union. Meyer's experiment, in which a pelvic fracture was made on one side and hebosteotomy on the other, with prompt healing of the fracture and no bony union on the cut side, also confirms his belief. Ossification of the fracture was partly facilitated by the spicules of bone partially bridging over the gap. These, of course, were absent in the smooth sawcut and the connective tissue which forms, seems to be an obstacle to the development of bony tissue. Therefore, he says that this fact must be taken into consideration in the future, namely, that in practically all cases fibrous union occurs; but, as to how much softening and consequent widening of the pelvis may occur at a subsequent pregnancy, he does not care to express an opinion.— *Zur Frage der Heilung der Hebosteotomie Wunde. Zentralblatt f. Gyn.*, No. 7, 1908.

C. v. Bachellé.

The Action of Hydrastis and Cotarnin Preparations Upon the Uterus and Upon Blood Pressure. By E. Kehrer.

As the result of his elaborate experiment, Kehrer has drawn the following conclusions:

1. Automatic contractions of the uterine muscle are excited by hydrastis and ergot preparations even though the uterine nerves are absolutely cut off.

2. Ext. hydrastis canadensis has the least action of all the hydrastis preparations, while hydrastin and hydrastinin are much stronger.

3. Styptol and stypticin, ergot preparations, have a stronger action under the same circumstances.

4. Hydrastin, hydrastinin, styptol and stypticin have a perceptible action in a dilution of 1–200,000, and therefore these preparations have practically about the same value.

5. This action occurs in all stages of development of the uterine muscle, from birth on through all stages of pregnancy.

6. Berberin and berberinin have no action on the uterus.

7. In the case of intravenous, intramuscular or subcutaneous injection of these preparations, the action was similar to that described above. No sedative action could be determined for any of the ergot preparations, as is claimed by some who recommend their use in uterine hemorrhage during pregnancy.

8. All these cause a temporary cardiac depression followed by a moderate increase in blood pressure due to their action directly upon the blood-vessel.

9. Uterine muscular contractions follow independently of blood-vessel contraction.

10. The complete resemblance between ergot, hydrastis and cotarnin preparations speaks against the use of the last two in hemorrhage during pregnancy. — *Die Wirkung der Hydrastis und Cotarnin Präparate auf Uterus und Blutdruck. Monatsschrift f. Geb. und Gyn.*, bd. xxvi, h. 5.

C. v. Bachellé.

Placenta Prævia in General Practice. By Johannes Futh.

From statistics obtained from midwives Futh gives a rather complete report on 726 cases of placenta prævia. In 137 of these cases delivery took place spontaneously, version was required in 484 cases, extraction in 42 cases, forceps in 23 cases, and perforation was resorted to once. The metreurynter was used a few times, and the membranes were ruptured three times. The total mortality was 19.7 per cent., 143 women dying. Of these, 12 died before delivery, 9 during, and 122 after labor. Hemorrhage, or its results was the cause of death in 98 cases, sepsis in 31, and rupture of the uterus in 2 cases. No tampon was applied in 90 cases, 6 of which proved fatal, 4 of hemorrhage, 2 of fever. The tampon was used in 96 cases, in 16 of which the patient died, 13 of hemorrhage, 3 of sepsis. Futh argues from this that, while expectant treatment may be preferred in hospital practice, in private practice immediate delivery is safer than tamponing. He has applied this deduction to 10 of his own private cases with invariably good results for the mother. — *Zur Behandlung der Placenta praevia in der allgemeinen Praxis. Zentralb. für Gynäk.*, No. 12, 1907.

Carey Culbertson.

BOOK REVIEWS

A Text Book of Modern Otology. By John F. Barnhill, M.D., Professor of Otology, Laryngology, and Rhinology, and Ernest deW. Wales, M.D., Associate Professor of Otology, Laryngology, and Rhinology, State College of Physicians and Surgeons, Indianapolis. Octavo of 600 pages, with 300 original illustrations. W. B. Saunders Company, Publishers.

This is an exception to most text-books, in as much as it brings the subject discussed down to date. This is especially necessary in a work designed for students and practitioners, as the specialist does not depend upon text-books for his keeping abreast of the progress in his individual field. Particularly in Otology is there need of a modern work, as this specialty has advanced rapidly in the last decade. It is high time that chronic suppurative aural discharge should be regarded as dangerous for the patient as chronic appendicitis. Especially that the operative procedures are now worked out with most happy results.

This is the distinguishing feature of this book. The consideration in detail of the suppurative diseases of the ear and its complications is particularly complete.

Preliminary to this are three chapters by Dr. Wales on the anatomy of the temporal bone, physiology of the organ of hearing, and bacteriology of the ear. These cover seventy-eight pages and are concise and yet complete and are well illustrated with original and well-selected cuts. There are no surgical procedures that require a more accurate and perfect acquaintance with regional anatomy than those on the temporal bone, and lack of which leads to such dire results.

Perhaps too little space is given to consideration of the tuning forks, as without them it is impossible to deal with the differential diagnosis of those cases of deafness without suppuration. Also the surgery of the labyrinth is lacking in detail. This phase of aural surgery is still in development, but already a definite technique exists and should be given in a work of this size.

The simple and radical mastoid operations are especially well described and should prove a good guide for the general surgeon who is called upon to do these operations. The fact that in early childhood the relations of antrum and tympanum are somewhat different than in adults should be accented and thus complete the variations of the usual procedures.

The work, as a whole, is excellent and is what its title claims for it.

F. Gurney Stubbs.

A Text Book of the Practice of Medicine. By James M. Anders, M.D., Ph.D., LL.D. Professor of Medicine and Clinical Medicine at the Medico-Chirurgical College; Physician to the Medico-Chirurgical Hospital; Formerly Physician to the Philadelphia and to the Protestant Episcopal Hospitals, Philadelphia; Fellow of the College of Physicians; Member of the Academy of National Sciences, Philadelphia, Etc. Eighth Edition, thoroughly revised. Philadelphia and London: W. B. Saunders Company, 1907.

This volume is a well-digested presentation of the subject-matter of Internal Medicine, thoroughly revised to the present time, and well suited to be placed in the hands of students. It is a neat, compact, and well-arranged volume, clearly written, and well-indexed.

In those diseases to which recent additions to our knowledge have been made, the subjects have been entirely re-written, notably the Animal Parasitic Diseases, Aplastic Anæmia, Polycythæmia and Cyanosis with Splenic Tumor, and Stokes-Adams Disease.

A criticism which to the mind of the reviewer applies to most text-books of Medicine, and to which the present volume is no exception, is that in attempting to be logical, and clear in subdividing the subjects, the pathology of the various diseases is considered independently of the clinical manifestations, thus gaining clearness in the subdividing of the subject, but losing a great opportunity in using the pathology to explain the clinical manifestations in the description of the diseases. The idea should be to present living pathology, with its manifestations in the order of their development, and to allow dead-house pathology to assume an inferior station.

Chas. A. Elliot.

A Short Practice of Gynecology. By Henry Jellett, B.A., M.D., B.Ch., B.A.O. (Dublin University) F.R.C.P.I. Third edition, revised and enlarged. With 310 illustrations. London:

J. & A. Churchill; Philadelphia: P. Blakiston's Son & Co.; price, $5.00, net.

As stated in the third edition of this work, the present edition of A Short Practice of Gynecology has been submitted to a careful revision throughout, so as to make it represent, as far as possible in a book of the size, the present state of gynecological practice. In particular, the chapters dealing with operations have been largely rewritten, and much new matter added to them. The publishers have added much to the interest of the book by including a large number of new illustrations. As stated by the author, it is impossible satisfactorily to describe gynecological operations without the help of illustrations. A number of the old illustrations have been withdrawn.

The book consists of chapters on the Diagnosis of Gynecological Cases, Menstruation and its Disorders, Diseases of the Bladder and Urethra, Diseases of the Vulva and Perineum, Diseases of the Vagina, Diseases of the Uterus, Diseases of the Fallopian Tubes, Diseases of the Ovaries, Diseases of the Pelvic Peritoneum and of the Uterine Ligaments, Traumata of the Genital Organs, Genital Atresia, Internal Hemorrhage of Genital Origin, Gynecological Operations, Celiotomy, Operations on the Urethra and Bladder, Operations on the Vulva, Perineum and Vagina, Minor Operations of the Uterus, Major Operations on the Uterus, Operations on the Tubes and Ovaries, Operations on the Uterine Ligaments and Pelvic Peritoneum.

This little volume of 500 pages, covering the entire range of gynecology as indicated by the list of subjects quoted above, is clearly, systematically and interestingly written. The illustrations are unusually fine and from an artistic standpoint are excelled only by some of the work done by the illustrators of Johns Hopkins University. The author evidently appreciates the Johns Hopkins corps of artists inasmuch as he has copied illustrations quite freely from Kelly's magnificent work. The work done by his own illustrators is unusually well done and does not suffer materially by comparison with the Johns Hopkins illustrators.

The description of operative technique given in the text is unusually clear and definite. The book does not abound with historical description of obsolete operations, although the author is generous in giving credit where credit is due and exhibits unusual judgment in his final selection of operative procedures. The book is pre-eminently one of technique rather than of pathology or diagnosis.

THE TEXT-BOOK OF MINOR SURGERY. By Edward Morton Foot, A.M., M.D. D. Appleton & Co.: New York and London, 1908.

This book will appeal to a great many physicians, and students as well, who, as the author states, rarely do more than minor surgery, and to whom the consultation of the many excellent text-books on surgery is too burdensome, dealing as such works do, with details of diagnosis and operations which are impossible under the circumstances confronting the average practitioner, viz., laçk of modern hospital facilities, trained assistants and nurses.

The compilation of facts regarding cases treated and observed during a large and varied experience, together with a Working Index and Classification of the same renders the book a valuable addition to the library of the average practitioner.

The many photographs are valuable in fixing the pictures of pathological conditions, making the text more applicable to the case at hand.

Especially to be commended is the chapter on Bandaging which is of such importance in the treatment especially of ambulatory cases.

HERBERT A. POTTS.

A REFERENCE HANDBOOK OF OBSTETRIC NURSING. By W. Reynolds Wilson, M.D. Philadelphia: W. B. Saunders & Co.

This is a very compact and concisely developed little volume, convenient in size, well bound, up-to-date, and it contains all the information necessary for a nurse in charge of obstetric cases. The material has been ordered in a very satisfactory and perspicuous manner. A very valuable feature is the copious index. C. S. REED.

BOOKS RECEIVED.

SURGERY: ITS PRINCIPLES AND PRACTICE. Volume III. In five volumes. By 66 eminent surgeons. Edited by W. W. Keen, M.D., Philadelphia and London: W. B. Saunders Company. 1908. Per volume, cloth, $7.00, net; half-morocco $8.00, net.

DISEASE OF THE HEART. By Prof. Th. von Jurgensen of Tubingen; Prof. Dr. L. Krehl of Greifswald; and Prof. Dr. L. von Schrotter of Vienna. Edited, with additions, by George Dock, M.D., Ann Arbor, Mich. Philadelphia and London: W. B. Saunders Company. 1908. Cloth, $5.00, net; half-morocco, $6.00, net.

DISEASES OF THE BREAST. WITH SPECIAL REFERENCE TO CANCER. By William L. Rodman, M.D., LL.D., Philadelphia: B. Blakiston's Son & Co. 1908. $4.00, net.

CORRESPONDENCE

LIVER RESECTION

CHICAGO, November, 22, 1907.

To the Editor of the Nicholas Senn Festschrift,
Herrn Franklin H. Martin, M.D.

Very Esteemed Colleague:

After the publication of my article on Liver Resections in the September number of your esteemed journal, Dr. Jacob Frank, of Chicago, claims priority by referring to a paper of his published in the Journal of the American Medical Association, of August 12, 1905. He requests me to enlighten the publisher of the Senn Festschrift of my error, and to acknowledge his priority.

I am sorry to admit not being acquainted with the aforesaid article of Dr. Frank, otherwise I should have drawn the attention of my American readers to it, as the article was originally intended for them. I regret the oversight.

If in the meantime Dr. Frank claims priority for his method, I must refer to all, but one, of my successfully executed liver resections on man, by the described suture method, dating from the year 1898 to 1905, i. e., long before Dr. Frank made his experiments on animals. (A special copy enclosed, with dates of operation marked, can prove this.) The drawings in my work were taken from sketches out of my "Alten Krankengeschichten," so I cannot unconditionally concede the priority of publication to Dr. Frank.

In "Brun's Beitragen," bd. 27, s. 231-232, we find, e.g., case 5 of my series mentioned, referring to the liver suture with which I closed the extensive resection surface. That was in 1890.

Furthermore, Dr. Steida, in an article, has referred to my operation on the biliary tract, ibid., bd. 47, s. 673, illustrating in Fig. 2 my mode of liver suture.

Finally, Staff Surgeon Dr. Thöle (one of my former assistants), in a paper read before the German Surgical Congress, in April, 1905, had at his disposal, my entire material on liver resection, in which the method of treatment practiced by me, was thoroughly described. Of course, he did not enter deeply into the technical questions, therefore, the merit of testing the method in experiments on animals, belongs undisputed to Dr. Frank.

For that matter, in no part of my work, did I refer to his method of liver suture, discovered by me, for I am convinced that this or that surgeon, in conjunction with myself, now and then use the same method in liver resections. If I, therefore, have quoted my experiments and good results, I only wanted to prove thereby, that the complicated liver suture methods, so warmly recommended to us in late years, are not absolutely necessary, and that even in extensive liver resections, we can obtain the same results with the simple methods at the disposal of every surgeon.

Very respectfully yours,

PROF. DR. GARRÉ.

PRIMARY EPITHELIOMA OF THE CLITORIS. REPORT OF TWO CASES

BY EGBERT H. GRANDIN, M.D., NEW YORK.

Attending Gynecologist, Columbus Hospital; Associate Surgeon, Women's Hospital of the State of New York.

This condition would appear to be of such exceeding rarity, that I report the following two cases — the only ones which I have seen during my medical career of nearly thirty years.

CASE 1. In March, 1902, Dr. Albert Kohn, of this city, requested me to see Miss N. in consultation for the purpose of determining the nature of a growth of the clitoris. He told me that he had had her under observation for a few months and that the growth in its initial stage resembled a pimple. When I saw her, a hardened mass of the size of a hazel-nut occupied the region of the clitoris. There was a certain amount of induration of the right labium minus. There were a few glands in the groin. I advised, and performed, wide excision of the clitoris and the labium. Primary union resulted. The report of the pathologist was epithelioma. After a few months, the woman died of general carcinosis.

Case 2. Seen in consultation with Dr. Henry Griswold, of this city. The woman was aged over sixty, and the clitoris was occupied by a growth the size of a small walnut. There was no glandular involvement and the labia were free. Wide excision was performed, This was in 1903. The report of the pathologist was epithelioma. In September, 1907, I saw the woman again and there was recurrence in the same region, but still no glandular involvement. I again excised the growth widely; and up to date, February, 1908, there has been no recurrence.

SURGERY, GYNECOLOGY AND OBSTETRICS

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HEMORRHAGE FROM THE STOMACH AND DUODENUM

BY WILLIAM J. MAYO, M. D., ROCHESTER, MINNESOTA

GIVEN a patient who has suffered from gastric distress, acidity, and other evidences of ulcer, and then suffers from repeated hemorrhages shown in the vomitus and in the stool, the diagnostic value of the hemorrhage is very great; but a single hemorrhage from a patient who has not had previous gastric symptoms is probably not due to ulcer.

Hilton Fagge long ago called attention to rupture of the veins about the cardia from cirrhosis of the liver and also to swallowed blood from hæmoptysis, as a frequent cause of supposed gastric hemorrhage. With increasing experience we are less inclined to look upon hemorrhage as either a sure sign of, or its absence as contraindicating, the presence of ulcer.

An examination of the gross specimen of the contents of the stomach after the test meal for blood is important, and sometimes of even greater differential value than the finer laboratory tests, especially as between ulcer and cancer. The delicate tests now used may sometimes give a reaction from blood produced by the slight traumatism inflicted by the introduction of the stomach tube itself, which an examination of the whole specimen would show to be traumatic.

Visible or occult blood in the stool affords proof as to the fact that there is blood, but it should never be lost sight of that it bears with it no evidence as to it exact gastrointestinal origin. The patient may have bleeding gums or hemorrhage from some slight abrasion in any part of the many feet of mucous membrane which exist between the lips and the anus. If occult blood is found by one chemical test, it must be corroborated by others, as some unsuspected food or drug may give rise to the reaction.

As a matter of fact, hemorrhage from ulcer is by no means of frequent occurrence. The base of the ulcer is clean and free from granulation tissue so that bleeding may be infrequent. Careful examination of the stool for many days may be necessary to detect its presence; quite contrary to the condition in cancer, where occult blood in the fæces will be found in the majority of cases, in this respect resembling the hemorrhage from cancer of the cervix, rectum, bladder, mouth and other mucous surfaces.

Graham says that "Coffee ground blood and lactic acid in the stomach contents are strong indications of cancer, and that occult blood will usually be found in the fæces of these cases, especially, if the free hydrochloric acid is reduced or absent."

Copious hemorrhage at infrequent intervals is the history of a considerable percentage of ulcers, while continuous small hemorrhages are the rule in cancer, although in some cases continuous loss of small quantities of blood does take place in ulcer, producing a degree of anæmia which requires careful differential blood examination to tell from the pernicious type, and occasionally a cancerous erosion of large blood-vessels will cause death from hemorrhage.

Ninety to ninety-six per cent of gastric and

duodenal hemorrhages cease spontaneously. Fatal hemorrhage occurs in from four to ten per cent, and in fifty-five per cent of these the splenic vessel is involved. (Brinton.)

Eighteen and one-half per cent of those dying from hemorrhage die so quickly that an operation could not be performed. (Savariaud.)

Bleeding ulcers can be divided into three groups: First, the acute round peptic ulcer, of Cruveilhier. In several cases of this type, which we have had an opportunity to examine, where the stomach was opened and the bleeding point found, the ulcer did not prove to be round, but rather a small fissure which was detected with difficulty.

The second variety is the mucous erosion of Dieulafoy varying to a greater or less extent in size, and in which the affected mucosa "weeps" blood. Like the acute peptic ulcer mucous erosion is probably infective or toxic in origin. Fig. 1, is a photograph of the gastric mucous membrane in a fatal case of the Dieulafoy ulcer which came under our observation.

In the older literature on this subject we find constant reference to the peculiar frequency of gastric hemorrhage in young women, which are of doubtful origin, but supposed to be due to ulcer. Hale White described some cases of hemorrhage of the stomach in young women which belong to this category and which he calls gastrotaxis.

Acute peptic ulcer and mucous erosions are rare conditions. Generally speaking, hemorrhage from these acute processes belongs to the

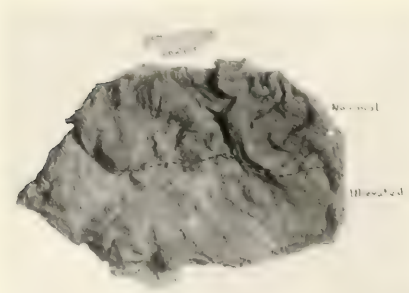

Fig. 1. Photograph of large mucous erosion of stomach.

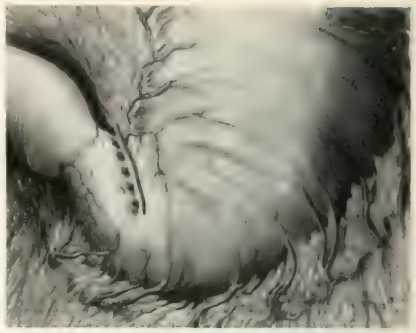

Fig. 2. Saddle ulcer of lesser curvature involving anterior and posterior surfaces, showing varicose blood vessels in the margins of the ulcer. Anterior margin of excision outlined by dotted lines.

domain of internal medicine rather than that of surgery, and a large percentage of these patients recover spontaneously.

The third variety, that of hemorrhage from a chronic ulcer, is surgical, although not necessarily operative during the acute stage. (Rodman.) The whole thing turns on the history of the patient. If the patient gives an ulcer history extending over a period of time before the hemorrhage, this at once differentiates it sharply from all the non-surgical hemorrhages of the stomach, and in the large majority of cases, from these little understood processes which are included with acute peptic ulcers and mucous erosions.

More than ninety per cent of hemorrhages from the stomach are from chronic ulcers with a well-marked ulcer history. In the greater number the condition would have warranted operation independent of the hemorrhage. So long as the surgical indication furnished by the hemorrhage is backed by the ulcer history, we know that we have a definite local lesion to deal with, and that the patient will be relieved not only of the hemorrhages, but also from the chronic disability of the primiary disease.

I do not mean to say that operation should not be practiced where there is hemorrhage from the stomach without previous history of ulcer, but rather that in such cases the burden of proof must show why an operation should

be performed; while in hemorrhage from chronic ulcer, the burden of proof must show why an operation should not be performed.

As to the surgical treatment of hemorrhage, there is some difference of opinion. Many surgeons believe that gastrojejunostomy is efficient as a curative agent without direct attack upon the bleeding vessel. While we would agree with this opinion as regards small and moderate hemorrhages, in cases of severe bleeding from prepyloric and duodenal ulcers, gastrojejunostomy may prove inefficient. We had one patient die from hemorrhage twelve days after gastrojejunostomy; and post-mortem revealed the open vessel in the margin of the ulcer. A second case of the same nature required re-operation with direct attack upon the bleeding vessel in the ulcer six days after gastrojejunostomy. A third suffered repeated hemorrhage following and two years later the ulcer was excised with cure. Many such experiences are recorded in literature.

Gastrojejunostomy after the posterior "no loop" method gives ideal results if there is actually or potentially, interference with the progress of food. When the ulcer is some distance above the pylorus permitting of ready egress by the normal outlet, gastrojejunostomy is of less value.

There has been considerable discussion as to whether the bowel in gastrojejunostomy should be turned to the right or allowed to remain in its normal position to the left. Regarding this point I can only say that in 292 cases of "no loop" gastrojejunostomies in which the intestine was sutured as it runs to the left, we had but three deaths and two re-operations; both of the latter from adhesions which were corrected at the second operation by fastening the bowel to the left beyond the gastrojejunostomy to prevent angulation.

In connection with the gastrojejunostomy, if an ulcer exists in the stomach it should be excised if possible. When this is not feasable

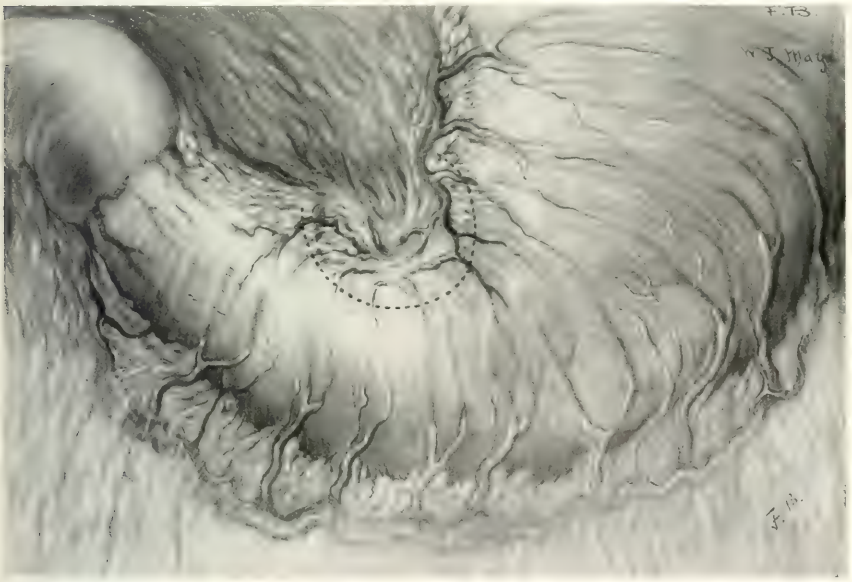

Fig. 3. Showing closure of stomach defect after excision of ulcer in such manner as to enlarge rather than diminish the lumen. Anterior half of suture line shown

the main blood vessels leading into it should be ligated and the peritoneum and muscular coats drawn over it. Excision, however, is the better procedure as it gets rid of the disease and prevents a possible secondary cancerous degeneration. (Figs. 2 and 3.)

Bleeding ulcers which lie a considerable distance above the pylorus should be excised. In extensive ulcers, such as the hour-glass variety, this may amount to resection in continuity. In doing this resection much deformity may result from the plastic closure of the gap produced by removal of the ulcer, and should the deformity interfere materially with drainage through the pylorus, gastrojejunostomy n addition may be required. In hemorrhage from duodenal ulcer, ligation of the blood vessels and closure of the outer coats over the indurated area with gastrojejunostomy, will be found efficient.

In the majority of bleeding ulcers, both of the stomach and duodenum, the blood vessels leading into them are varicosed. (See Fig. 2.)

For severe hemorrhage from the stomach, in those cases in which no ulcer can be located from the exterior, we have followed a modification of the Andrews-Moullin method, opening the anterior wall of the stomach by a longitudinal incision, and by counter pressure cause successive areas of the mucous membrane to present itself at the opening until the bleeding point is detected. With chromic catgut on a small curved needle, the hemorrhagic area is sutured from the mucous side. Over this, on the peritoneal side, a few linen sutures are introduced for protection, after which the working incision into the stomach is closed in the usual manner.

FALSE DIVERTICULA OF THE APPENDIX

By HAROLD UPCOTT, F. R. C. S.
Hon. Assistant Surgeon Hull Royal Infirmary

IT is well known that the appendix is subject to various affections, mainly of an inflammatory nature, which may be attributed to peculiarities in its anatomical structure.

The large amount of lymphoid tissue, lying between the muscular and mucous coats, its dependent position at that part of the intestinal tube where the bacterial flora attains its greatest luxuriance, a somewhat precarious blood supply, a mobility allowing of changes in position which may readily interfere with the outflow from so small and narrow a tube — all these are factors peculiar to the appendix, which is thus rendered a prey to grave infective processes far more frequently than any other division of the intestine.

Apart from these diseases, however, the appendix shares with other parts of the alimentary tract a liability to become the seat of new growths, or to be the starting point of certain chronic inflammatory diseases such as tubercular or actinomycotic infections.

These are all well known; and now that the appendix is more often submitted to microscopical examination, so are cases exemplifying such conditions reported with greater frequency.

There is another pathological change occasionally met with in the intestine, particularly the large bowel, which may also occur in the appendix; this is the mucous hernia or false diverticulum. Attention was called to this affection by Seelig in an article published in the Annals of Surgery,[1] and as an example came under my observation about that time I was led to investigate the subject, thinking that the condition might be less rare than the paucity of reported cases suggested. More recently a striking case has been reported by Herb,[2] and in this article will be found references to the literature on the subject.

The material I found available for investigation comprised some three or four hundred

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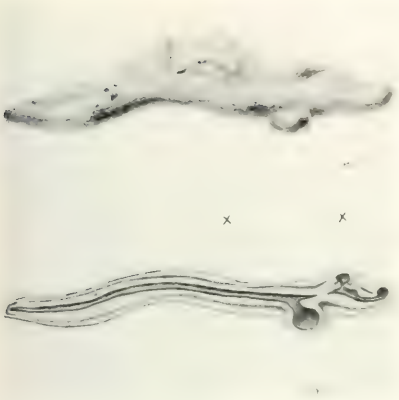


Fig. 1. Appendix in Case 1. Shewing diverticulum on antimesenteric surface, one inch from top.
Fig. 2. Longitudinal section, Case 1. Shewing three diverticula II gaps in muscle coat.

appendices, the exact number is immaterial since they were not all examined by section or with the microscope and in the absence of such methods it is quite possible that several examples may have been overlooked. Among these were two well-marked instances of diverticula formation, one of which had been recognised at the time of operation, and several specimens which seemed to throw some light on the possible causation of the condition.

For permission to make use of their cases, I am indebted to Mr. H. Littlewood and Mr. B. G. A. Moynihan, who kindly afforded me access to the appendices removed by them, both from cases under their care in the Leeds General Infirmary and from private patients. A most excellent example has been sent to me by Mr. J. F. Dobson, of Leeds. (Figs. 10 and 11.)

Case 1. This appendix (Fig. 1.) was taken from a woman, aged about 50, and although she had complained of indefinite pains in the right side of the abdomen for some time, yet there was no history of a severe attack, such as might be caused by a perforation. The organ is somewhat lengthy; it presents about one inch from its tip, on the side opposite its mesentery, a hemispherical projection, the size of a pea. The surface of the appendix, near this swelling is slightly injected, the appearance of the remainder of the organ does not depart in any marked degree from the normal, though towards its cæcal end it is considerably narrower than in its distal portion.

On laying open the appendix (Fig. 2), the line of section falling across the diverticulum, the gross changes are clearly seen. The lumen of the proximal half of the tube was obliterated with inspissated debris; the tip of the appendix is distended and protrudes through the muscular coat, while through a hiatus in this layer, one inch from the tip, a well marked hernia of the mucosa is apparent, filled with cellular debris. Beyond this comparatively large diverticulum are two minute protrusions, each appearing on the surface of the appendix as a small nodule, about the size of a hemp seed. (Only one of these smaller herniæ is seen cut across in the figure.)

Microscopical sections of the larger diverticulum shew a remarkably abrupt ending of the muscular coat of the appendix on either side of the gap, through which the mucosa has bulged. The epithelial lining of the diverticulum is eroded, the cells are shorter and the tubules scarcer than usual. The muscularis mucosæ can be traced around the diverticulum.

Case 2. The history of the case from which this appendix was obtained, could not be traced. This organ is represented diagrammatically in Fig. 3, which also shews the lumen and the diverticula therefrom. Transverse sections, as seen under a low magnification, are depicted in Figs. 4, 5, 6, and 7.

Towards the distal part of the appendix, on the side away from the mesentery, was a small projection which aroused my interest; the layers of the meso-appendix were separated by what I took to be considerable glandular enlargement. On cutting across the appendix, the swelling on the anti-mesenteric surface was seen to be due to a diverticulum, while the swellings which still appeared to the naked eye as swollen glands in the mesentery, proved on microscopical examination to be other diverticula filled with debris. By reconstruction of the appendix from these sections, it was found that it presented four diverticula, three of which protruded between the layers of the mesentery.

It is this latter fact which makes it seem probable that other examples of this condition were overlooked, for a swelling of the mesentery, presumably due to in-

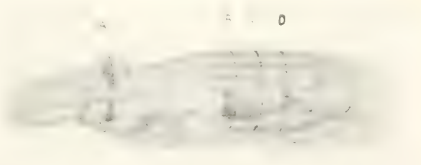


Fig. 3. Schematic reconstruction of appendix, Case 2. Shewing lumen with four diverticula. A, B, C, D shew position of sections in following figures.

Fig. 4. Transverse section of appendix, Case 2. Section passes through two diverticula on opposite sides of appendix.
Fig. 5. Section of appendix, Case 2. (Fig. 3B.) X shews gap in muscle coat with vessels passing through.
Fig. 6. Transverse section of appendix, Case 2. (Fig. 3C.) Passes through same diverticula as Fig. 5.
Fig. 7. Transverse section of appendix, Case 2, (Fig. 3D.) It passes through tip of diverticulum seen in Figs. 5 and 6, and also through a smaller hernia protruding along side vessels.

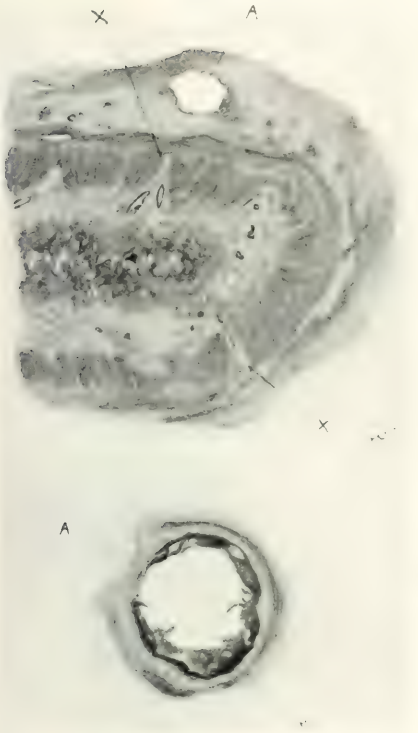


Fig. 8. Section through tip of appendix shewing gaps in muscle layer through which vessels are passing. A, a minute focus of suppuration in subperitoneal tissue.

Fig. 9. Section of perforated appendix. A, floor of ulcers formed only by mucous and sub-mucous coats.

flammatory œdema, was not deemed sufficient reason to lead to further and more minute investigation.

Two of the protrusions in this specimen occur opposite each other and are included in one transverse section (Fig. 4). Another diverticulum has insinuated itself for a short distance between the layers of the meso-appendix parallel with the lumen of the tube, while the fourth is a minute hernia not yet passed beyond the muscular envelope.

Case 3. This specimen was removed from a man who had had two attacks of appendicitis. The appendix is short and thickened, the opening into the cæcum is impervious and the organ was removed by Deaver's method with a small portion of the cæcum. The proximal part of the appendix is distended, and it presents on the side away from the mesentery and quite close to its base a thin-walled, almost translucent diverticulum a quarter of an inch in diameter. Adherent to the mouth of the diverticulum and partly occluding its opening is one end of a fibrinous strand which passes obliquely across the lumen of the appendix. A small tag of omentum is adherent to the outer surface of the diverticulum. (Figs. 10 and 11.)

Diverticula of the intestine may be divided into two classes, congenital and acquired. The walls of the former are composed of all the coats of the bowel, they are, therefore, true diverticula; of these the best example is afforded by Meckel's diverticulum. Probably also those small blind protrusions of the upper part of the small intestine, commonly associated with aberrant portions of pancreatic tissue, should be included under this heading, though by some they are regarded as acquired true diverticula, resulting from traction.

Acquired diverticula may be either true or

Fig. 10. Appendix; Case 3. A, diverticulum. B, adherent omentum.

Fig. 11. Section of appendix from Case 3, shewing diverticulum at A.

false, and it is to the latter class the specimens I have described must be referred.

It will be interesting to turn for a moment to false diverticula, as found elsewhere in the intestine, in the hope of throwing some light upon their causation.

They have been found in the small intestine as multiple protrusions, occurring between the leaves of the mesentery; and it has been shewn that in their course they appear to follow the terminal branches of the mesenteric vessels. Whether undue distension of the bowel is necessary for their development is not certain, but their choice of position is probably determined by the fact that the perivascular lymph space affords but little impediment to the early stages of their development.

False diverticula are most frequently found in the large bowel, the ilio-pelvic colon being the seat of election. In this situation they may give rise to conditions of the utmost importance from the surgical point of view. Whether these diverticula of the large intestine follow the same rule in protruding opposite the blood-vessels is a debatable point; one such specimen that I have examined gave me no reason for thinking that this was the case.

To return to the appendix: there are one or two points in its anatomy and certain pathological changes relative to its perforation by infective processes which are of importance in this connection.

No other portion of the human digestive tube has a muscular coat so thick in proportion to its lumen; piercing the thickness of this coat, are gaps or spaces through which blood-vessels enter and lymph-channels emerge from the sub-mucous layer. One such gap or hiatus is described by Lockwood [1] as being constantly present opposite the base of the meso-appendix, but I have found these gaps not confined to the base of the organ. Fig. 8 is a drawing of a section through the tip of an appendix, and it shews several of these gaps in the muscular layer. Figs. 2, 5, and 6 illustrate the same point.

Possessed of this stout contractile envelope, the appendix must be capable of exerting considerable pressure upon its contents when for any reason its outlet becomes obstructed. It is possible that under such conditions, if long continued, the mucosa may become herniated through one of the spaces which I have mentioned, though it is doubtful if this ever takes place unless the gaps are rendered more permeable by disease. A closer examination of those appendices which are the seat of diverticula shews that their muscular coats are thicker than usual, the blood-vessels appear to be not only particularly numerous but also possess greatly thickened walls; moreover the sub-mucous meshwork wherein they lie is of greater extent than normal, with the naked eye the ring of mucosa is seen to be separated by a wide interval from the investing muscular layer. Under the microscope the sub-mucosa is seen to contain many new connective tissue elements and several of the thick-walled vessels are occluded by organised clot. All these appearances I take to indicate a former period of inflammation through which the appendix has passed; the effective agents of the inflammation have been subdued only after a long period of reaction on the part of the tissues; the effects of this reaction to a long continued stimulus have resulted in an over-production on the part of the mesoblastic tissues, in other words, a productive type of chronic inflammation.

The result of this hyperplasia of the muscle coat will be to increase the pressure upon its contents; at the same time the weak points in this layer will be still further weakened by the increased size of the vessels traversing them, and by the accompanying perivascular tissue. Under such conditions as these a hernia might well protrude itself through one of these spots of lessened resistance. The appearances seen in sections of appendix 2 (Fig. 4, 5, 6, and 7.) lend support to this view.

Thus far no mention has been made of the relation of perforation to diverticula formation. That a diverticulum may lead to a perforation, indeed favour its occurrence, will be readily admitted, and if the protrusion is not situated between the leaves of the meso-appendix so much the greater will the danger be. Specimens demonstrating this sequence of events are not easy to find, for the infective gangrene, the essential factor in perforation, so destroys the relations of parts that their previous condition can be only surmised.

[1] Appendicitis: Its Surgery and Pathology. Macmillan.

Whether the reverse order of events may occur, a perforation lead to a subsequent mucous hernia, is hardly susceptible of proof from the limited number of specimens examined.

It should be remembered that neither in the case where I was able to record the anamnesis nor in Seelig's case were there any clinical phenomena indicative of former perforation. Still there are two ways in which a perforation might lead to a diverticulum, in their pathogenesis they may be likened to traumatic aneurisms. In one case a wound of the vessel heals and the resulting scar gradually gives way at some later time. In the other case, the vessel walls are weakened by a local destruction of their outer coats and at this weakened spot the inner coat protrudes.

A stage in the latter process may perhaps be illustrated by Fig. 9, taken from an appendix which presented a small clean cut perforation not obscured by swelling of the tissues around. The section does not actually pass through the perforation, but is extremely close to it. It can be seen that, for a portion of its circumference, the wall of the appendix is formed of mucous membrane and submucosa alone; on either side of this area the circular and longitudinal muscular coats end abruptly. The edges of the muscular layer are slightly swollen and, for a short distance away from the edge, the nuclei fail to take up the stain. That part of the submucosa which forms the floor of the deficiency is also devoid of staining nuclei. Except for chronic changes in the mucosa, the remainder of the circumference of the appendix appears fairly normal.

The inflammatory process appears at one point to have passed the restraining barrier of the mucous membrane without arousing the resisting forces of the leucocytes, and, finding the tissues unprepared for defence, the bacterial toxines have lead to a rapid death of the highly specialized muscle cells, and, to a more limited extent, of the sub-mucous tissue.

Why the destruction should be so limited in the absence of any marked protective reaction is not quite clear; it may be that it is due to a local diffusion of bacterial poisons alone, the organisms giving rise to them falling in the breach as it were. If it is permissible to imagine such a breach of microscopical extent, followed by a limited and finite destruction of the muscular coats, it is easy to see how a false diverticulum may arise from any later increase in intra-appendicular pressure.

In Seelig's case there was an absence of muscularis mucosæ, both in the wall of the appendix and of the diverticulum; and he quotes Obendorfer as stating that this is evidence of past inflammation. I believe that an inflammation needs to be servere that it may destroy this membrane completely; in milder infections it is easy to see that the muscularis mucosæ is destroyed only opposite the swollen and infiltrated lymphoid follicles. In the specimens which I report, the muscularis mucosæ can be traced in the wall around the greater part of the diverticula.

In view of the small number of specimens recorded, it is not possible to make any definite statements as to the etiology of the condition. It seems probable, however, that such appendices have always been the seat of a chronic inflammation, that this has the effect of increasing the relative size of the gaps in the muscle coat through which the vessels enter, and that it is through these gaps that the hernia are extruded.

That a diverticulum may follow an acute infective necrosis limited to a small portion of the appendix wall is not proved by the material I have examined, though certain specimens of perforation are suggestive of its occurrence.

PRIMARY OVARIAN PREGNANCY[1]

With the Report of a Case

By C. C. NORRIS and C. B. MITCHELL

OVARIAN pregnancy is one of the rarest of all forms of extrauterine gestation, so little of the condition is known that the greatest interest is attached to each new case recorded. The term ovarian pregnancy should be applied only to those cases in which the ovum has been fertilized before its escape from the Graafian follicle, the spermatozoa having directly entered the follicle just after its rupture. This may also occur in a deeper follicle, which has ruptured into a more superficial one, the spermatozoa passing through this to the ovum, lying in the deeper follicle. Although there is no longer any doubt that such a fertilization may occur with a resulting pregnancy in the ovary, the rarity of the condition demands a careful report of each case. Dr. Howard Kelly considers this one of the greatest of all gynecological rarities and has never had a case. The thought has been advanced that the condition occurs more frequently than has been supposed and that a careful examination of all cases of ovarian tumors would greatly increase the percentage of cases. This in a certain measure is true; nearly as many cases having been reported during the last six years as were reported during the entire previous century. Yet it must be granted that the condition is still a very rare one. In our laboratory of Gynecological Pathology at the University of Pennsylvania where, during the last 8 years, some 1700 gynecological specimens have been examined, we have had but one case of ovarian pregnancy. During this time we have examined 58 hemorrhagic cysts of the ovary, 62 small ovarian tumors including dermoids, 44 extrauterine pregnancies — all of which conditions are supposed to be occasionally mistaken for ovarian gestations. Among this number were two cases which macroscopically closely simulated ovarian pregnancy; but a careful histological study of serial sections from the tube proved one to be a case of tubal abortion and the other a tubo-ovarian pregnancy. Such cases, however, without a thorough histological examination might easily be mistaken for ovarian pregnancies.

The discussion as to the possibilities of the occurrence of ovarian pregnancy, extended from the 17th century to 1901. So many cases were reported which were undoubtedly false that the scepticism of many authorities is not to be wondered at. No definite criterion had been formulated on which a diagnosis could be based; and until Spiegelberg in 1878 laid down the following conditions, which should be fulfilled in making a diagnosis, no really accurate work on this subject had been done.

1. The tube on the affected side must be intact and have no organic connection with the gestation sac.

2. The fetal sac must occupy the position of the ovary.

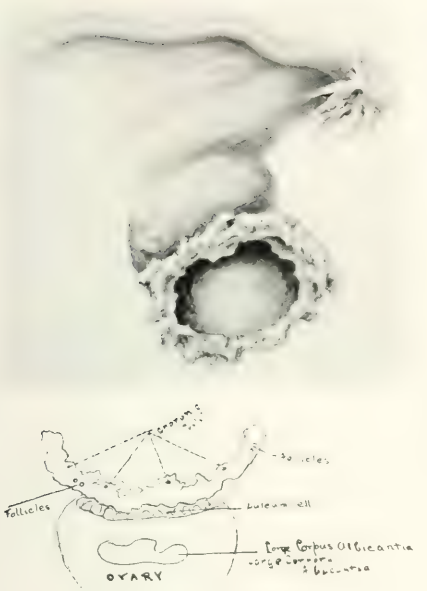
3. It must be connected with the uterus by the ovarian ligament.

4. Definite ovarian tissue must be found in the sac-wall in several places.

German authorities have for a long time admitted the possibility of ovarian pregnancy; and it is from them that we have some of the most carefully worked out studies of this condition. In 1898 Dr. Catherine van Tussenbroeck, of Amsterdam, reported a case of ovarian pregnancy before the Third Obstetrical and Gynecological Congress. This case undoubtedly did more to establish the fact that such a condition might exist than any other work. However, English scientists led by Bland-Sutton, remained unconvinced until 1901, at which time Bland-Sutton went to Amsterdam for the special purpose of examining von Tussenbroeck's case and after a careful study, admitted the correctness of her first report. Shortly after this time there appeared in America the very careful reports of Thompson and Webster.

Classifying the cases under the heads sug-

[1] Read before the Philadelphia Obstetrical Society, January 2, 1905.



Drawing of specimen with schematic sketch.

gested by Williams, we have found up to the present time 16 positive cases, 15 probable cases and 9 fairly probable which are as follows:

Positive (Gottschalk)	Highly probable	Fairly probable
van Tussenbroeck & Kowwer	Granville	Peuch
Anning & Littlewood	Hein	Geuer
Francz	Uhde	Kustner
Thompson	Franck	Toth
Robson	Schrenck	Croft
Hewetson	Walther	Guilford
Scheckele	Spiegelberg	Michanx
Boesebuch	Herzfeld	Frank
Bandel	Larsen	Law
Micholitsch	Leapold	
Kantorsvicz	Martin	
Webster	Gottschalk	
Kelley, J. K.	Lugwig	
Herrenschmidt	Czygwicz	
Freund	Oliver	

All of the positive cases are of about three months or shorter duration; 12 of the highly probable cases are at term, which is interesting in illustrating the greater distensibility of the ovary over that of the tube, a much small number of tubal pregnancies developing to full term before rupture. It is, however, readily seen that it is in the earliest cases that the most accurate diagnosis can be made. The great growth of the fetus destroys the relations and obliterates normal tissue, to such an extent that the fulfillment of all of Speigelberg's criteria is quite difficult.

The cases of von Tussenbroeck, Kelly, and Hewetson show the fully developed corpus luteum in relation to the fetal sac. In the case of Webster no such relation was noted.

It is interesting here to consider the theory of Webster, that the presence of Müllerian tissue is an essential factor for the developing of a fertilized ovum. The uterus and Fallopian tubes both develop from this tissue but the ovary arises from the Wolfian body. Therefore, according to Webster's theory, there must have been an embryonal inclusion of Müllerian tissue in an ovary which is destined ever to be the seat of a pregnancy. This theory is even of greater interest in considering the possibility of primary abdominal pregnancies.

PATHOLOGICAL REPORT

Name, Mrs. B.; patholog. No., 1684; operation, right salpingo-oophorectomy.

PATHOLOGICAL DIAGNOSIS

Normal tube. Ovarian pregnancy (primary).

MACROSCOPIC DESCRIPTION

The specimen consists of a tube and ovary.

Tube. The tube is normal in shape and size, and has the following measurements: It is 8.25 cm. in length. The diameter at the uterine extremity is 5 mm.; at the middle of the isthmus it is 6.5 mm.; and through the ampulla it is 8 mm. The surface is free of adhesions. The abdominal ostium is open. The fimbria are luxuriant. On section, the walls are normal in thickness and consistency. The lumen is empty. The mesosalpinx is normal.

Ovary. Measures 2.80 x 1.60 x 1.40 cm. Its surface, especially the posterior aspect shows numerous, vascular adhesions. The tunica albuginia is white and glistening. Attached to, or springing from the anterior and inferior surface, is a portion of the wall of a hemorrhagic sac. The outer surface of this is covered by a thin membrane, attached to which are a few vascular adhesions. On the inner surface, and making up the chief substance of the wall of the sac, is what appears to be an organized blood-clot. The sac shows a rounded outline, the concavity being away from the ovary. It measures 4 x 5 cm., and from the

appearance of the specimen it seems probable that the entire sac measured about 8 cm. in diameter. The inner surface of the sac shows numerous small dome-like elevations. Attached to these, and more or less over the entire inner surface, are shreds of whitish tissue, which upon close examination are found to be made up delicate thread-like projections which vary from 2 to 4 mm. in length. These are quite strong. This tissue resembles young placental tissue. The wall of the sac varies from 4 mm. to 1 cm. in thickness. The edges are rough.

HISTOLOGICAL DESCRIPTION

Tube. Serial sections from the outer third of the tube, including the fimbria, show this portion of the organ to be entirely normal.

Ovary and Gestation Sac. The section is through the entire thickness of the sac and almost the entire ovary.

The outer covering of the sac is made up of one or two layers of flattened cells which have deeply staining nuclei. Beneath this is a thick layer of organized blood-clots in which at various points can be distinguished chorionic villi, in some of which trophoblastic cells can be distinguished. The villi appear somewhat degenerated. Numerous syncytium cells can be distinguished. Some of these are arranged in a double chain of cells while others appear singly or in groups. Chorionic villi giant cells are seen.

The hilum of the ovary is rather more vascular than usual, but otherwise it is normal. The substance of the organ also appears unusually vascular. A number of corpora albicantia are present. One of these is unusually large, occupying about the third of the entire bulk of the ovary. Between this and the gestation already described, is a corpus luteum, from the depression on the surface of which the gestation sac has its origin. The corpus luteum covers the entire base of the gestation sac and in one area extends slightly beyond it. The lutein cells are in this case easily recognizable. The ruffle or fan-like arrangement so often spoken of in describing the yellow body is well shown. Some of the cells contain pigment. The differentiation of the individual lutein from the decidual cell is impossible; but from the arrangement of these cells and the general appearance of the sac which they line, we feel justified is stating positively that these are lutein and not decidual cells. Immediately beneath the sac the layer of lutein cells is thin but unmistakable, at the line of junction between the sac and the ovary numerous syntial cells are seen. The tissue at this point is very vascular. In at least two points in the wall of the sac, follicles are seen. From a careful study of this case it seems safe to assume that the pregnancy has taken place in a follicle. This case fulfills all of Spiegelberg's criteria.

This specimen is from the service of Dr. John G. Clark, he having operated on the case November 11, 1907.

WEBSTER. Trans. Am. Gyn. Soc., Phila., xxiv, 65-80, 1904.

FREUND. Virchows Arch. f. Part. Anat., cl, xxxiii, 54-91, 1906.

KELLY, J. K. Obst. & Gyn., London, ix, 389, 1906.

HEWETSON. Brit. M. Jr., London, ii, 568, 1906.

ROBSON. Tr. Obst. Soc. London, xliv, 215, 1903.

KELLY, H. Oper. Gyn. vol. ii, 434.

KELLY & NOBLE. Gyn. & Abdm. Surg., vol. i, p. 173.

LUDWIG. Weinerhlin, Wochenschn. 1896.

LEOPOLD. Arch. f. Gyn., bd. i, ix.

MICHOLITSCH. Zeit. f. Geb. u. Gyn., bd. xi, ix., h. 3.

ANNING & LITTLEWOOD. Trans. Obst. Soc., London. vol. xi, iii, p. 14, 1901.

VAN TUSSENBOECK, C. Lancet, Dec. 29, 1900.

BLAND-SUTTON. Trans. Obst. Soc., London, vol. xi, iii, 1901, part 1.

BLAND-SUTTON. Brit. Med. Jr., vol. i, p. 41, 1901.

BLAND-SUTTON. Albutt & Playfair Syn. of Gyn., p. 478.

LEOPOLD. Arch. f. Gyn., vol. xix.

HERRENSCHMIDT. Bull. et Mem. Soc. Anat. de Paris, vol. lxxxi, 289, 1906.

THOMPSON, J. F. American Gynecological Trans. 1902.

BANDEL. Beitrag. z. Klin. Chir. Tubung, vol. xxvi, 65 f., 1902.

GOTTSCHALK. Zeit. f. Geburt. und Gyn., vol. xlviii, 360, 1903.

MICHOLITSCH. Zeit. f. Geburt. und Gyn. vol. xlix, 508, 1903.

BOESEBUCH. Monatschift. f. Geburt. u. Gyn., Berlin, vol. xx, 613, 1904.

CZYGEWICZ. Zentralblatt f. Gyn. Leipzig., vol. xxx, 1369, 1906.

SCHECKELE. Beitrag. z. Geburt. und Gyn. Leipzig, vol. xi, 317, 1906.

SPIEGELBERG. Arch. von Gyn., 1898, bd. 13, S. F., 3.

WILLIAMS. Text-book of Obst.

THE SURGICAL TREATMENT OF CANCER OF THE SIGMOID FLEXURE AND RECTUM

With Especial Reference to the Principles to be Observed

By B. G. A. MOYNIHAN, M. D., F. R. C. S., Leeds

IT cannot truthfully be said that the surgical treatment of carcinoma, occurring in the upper part of the rectum or in the sigmoid flexure, is at the present time entirely satisfactory. Two reproaches may justly be brought against it: the first, that removal is attended, in no small proportion of cases, either by regional or by distant recurrence; the second, that colostomy has to be performed, on account of the sacrifice of a large portion of the bowel, in perhaps a majority of cases. The position at the moment seems to be this, that if only so much of the bowel is removed as will permit of end-to-end anastomosis, an adequate excision of the parts, intestine, lymph vessels, glands, and the tissues which bear them, can hardly be made; whereas, on the other hand, if these parts are freely removed, the performance of colostomy is compulsory. It is the purpose of this paper to shew that a free removal of the area involved is possible, and that with certainty in most cases, and with probability in all, an end-to-end approximation of the bowel is easily possible.

It is the first essential in all operations concerned with malignant disease that the removal of the parts shall be free, and that it shall follow certain lines. In the large intestine the growth itself must be removed, a length of bowel on each side of the growth, the lymph vessels which drain the bowel, the glands in which those vessels end (all the primary glands, that is, and as many of the secondary as are accessible), and finally all the tissue in which those glands and vessels lie. In the case of the sigmoid flexure, and of the upper part of the rectum, this will involve a removal of the growth and of healthy intestine on each side of it, and the excision of all the glands which lie along the arteries as far up as the inferior mesenteric artery at its origin from the aorta. At the point where this vessel arises a lymphatic gland is always to be found; it lies along the artery before the origin of the left colic branch, and is the highest of the chain which, beginning at the intestine (in any part), extends upwards along the sigmoid superior hæmorrhoidal arteries to the inferior mesenteric trunk. Beyond this gland, the chain is continued into the glands which lie along the aorta. This gland, therefore, which lies on the inferior mesenteric, close to its origin, must be removed, and all glands which lie below it, if the necessary conditions just enumerated are to be fulfilled. In the removal the inferior mesenteric artery may have to be ligatured, either immediately beyond its origin, or after the left colic artery has been given off. Probably in many cases, the gland can be stripped down from the vessel by firm wiping with gauze, after the peritoneum above it and on each side has been lightly divided. In two of my recent cases I have, however, found this impossible, and the artery at its origin has therefore been ligatured. This, for reasons presently to be disclosed, is not of the importance it might seem. The ligature on the artery is the summit of a wedge of material to be removed, the base of which lies at the intestine. The length of intestine which has to be excised is not a point to be specially considered, for though it may seem paradoxical it is nevertheless true that the more freely the gut is sacrificed the less likely is neurosis to follow, and the more certain is the end-to-end anastomosis to be successfully accomplished. In one of my cases, 14½ inches of the intestine were removed and end-to-end suture easily performed.

The two points of chief significance in the operation as I wish to describe it are:

1. *The mobilising and displacement of the intestine.* This is carried out by making an incision through the peritoneum at the outer side of the mesosigmoid, at the points where this mesentery springs from the parietal peritoneum. The sigmoid together with its mes-

entery is then stripped up from the iliac fossa towards the aorta, the peritoneum on the inner side of the sigmoid being lifted off the posterior surface of the abdomen until the middle line is reached. This stripping extends well upwards and downwards, until the whole flexure and the upper part of the rectum are attached only by a leaf of peritoneum on the inner aspect. At a later stage of the operation, the descending colon and the splenic flexure are similarly mobilised, by incising the peritoneum to their outer side and above the flexure and by stripping the gut inwards to the middle line. The middle and left colic arteries are in the peritoneal fold, which now forms, as it were, a mesentry for the bowel. The result of this freedom of the intestine is, that it can be quite readily drawn down so that the descending colon reaches well into the pelvis, and could, if there were need, be made to extend to the anus. In carrying out this manoeuvre the transverse colon also may be loosened, so that its central V-shaped dip is straightened. The splenic flexure is normally of course fixed high up on the left side; in its altered position it is made to descend several inches. This procedure has to be performed before it can be realised how perfectly simple it makes this displacement or transplantation (if one may so term it) of the intestine. The result of it is, that the bowel is rendered so free that it can readily be placed in such a position that the end of the descending colon can be brought into easy apposition with the divided rectum and union then secured by suture; and the vascular supply of the parts is secured by the preservation of the vessels in the peritoneal fold by which alone the mobilized gut now remains attached.

2. *The condition of the vascular supply.* It might perhaps be supposed that the severance of the inferior mesenteric artery would deprive a large part of the sigmoid and of the descending colon of its blood supply. This, however, is not the case. If the middle and left colic arteries be examined, it will be found that they anastomose at about two inches from the intestine, in a vessel which runs parallel with the bowel; from this artery straight branches pass to the intestine. That the circulation through this vessel is carried on quite freely after section of the inferior mesenteric may readily be demonstrated in any operation by loosening the clamp applied at the upper severed end of the sigmoid flexure; free hæmorrhage occurs at once. An examination of the vascular supply of the transverse and descending colons and the sigmoid shews clearly enough that the sacrifice of the direct supply to the left colic artery, by ligature of the inferior mesenteric, is not in the least likely to interfere with the easy transmission of blood through the vascular arch which the left colic makes with the middle colic above and with the sigmoid and superior mesenteric below. The important outcome of this is, that the upper divided end of the sigmoid flexure, at whatever high point the division is made, is freely supplied with blood, even after the inferior mesenteric trunk has been divided.

These two points, then, make it clear that a great length of the bowel may be sacrificed and the normally fixed parts of the large intestine above the division be rendered so mobile that their transplantation is a matter of no difficulty; and further, that the high division of the inferior mesenteric artery, made necessary by reason of its close relation to glands which it is imperative to remove, does not devascularise the upper end of the bowel which is to be engaged in an end-to-end anastomosis.

The precise details of the operation to be practised will depend upon the exact position the growth may occupy. I will first describe the procedure necessary in a case of growth about the middle of the sigmoid flexure.

The patient is placed in the Trendelenburg position and a long incision made in the middle line. A Doyen's valve-retractor now, or a little later in the operation, gives a good exposure of the pelvis. The intestines are packed away with swabs, only the rectum, sigmoid, and a part of the descending colon being at first visible. The sigmoid is lifted up from the posterior abdominal wall, and with the scalpel or scissors an incision is made in the peritoneum of the iliac fossa, immediately to the outer side of the mesosigmoid. This incision is continued down into the true pelvis, keeping close to the intestine, and up along the outer side of the descending colon. A piece of gauze wrapped round the fingers now strips up the mesosigmoid from the iliac fossa, and the

separation is continued steadily towards the middle line. The ureter is to be displayed in all the length of the incision, so that its security is in no doubt. The spermatic vessels are also seen, and are carefully handled, to avoid damage to the vein, which tears readily. The freeing of the peritoneum on the inner side of the sigmoid and the descending colon is continued until the aorta is reached, and the inferior mesenteric trunk is recognised at its origin. The bowel is now quite freely movable and can be turned well over to the right, attached by a single leaf only of the peritoneum in which the vessels lie. This peritoneal leaf is translucent; by holding it up to the light the exact line of the vessels can be seen, and the position of many of the glands defined. The raising of the peritoneum with the bowel has been carried out in such manner as to leave the pelvic wall bare, all fat and glands and vessels are raised up with the fold of the serous membrane. Into the space made bare a large hot moist swab is packed. The inferior mesenteric artery is now surrounded by an aneurysm needle at its origin; it is tied in two places with strong catgut, and divided. From this peritoneal wound two incisions are made, the one upwards towards that point where the sigmoid flexure or descending colon is to be divided, the other downwards over the aorta and along the front of the sacrum to the rectum at the place where its division is necessary. To meet the lower end of this peritoneal incision, a continuation is made of the incision already begun on the outer side of the sigmoid. The two meet across the front of the rectum or the lower part of the sigmoid. The point of their union is determined by the position of the growth. At this stage all that is necessary to remove the wedge-shaped area to be sacrificed is the division of the intestine above and below. This is effected between clamps, after sedulous care has been taken to avoid infection. The liberated mass is then removed. It may be 10 inches long at its intestinal base, or even more. The free vascularity of the upper extremity of the bowel may be demonstrated by a slight loosening of the clamp. The approximation of the two ends of the intestine would now seem perhaps to be almost impossible, but the mobilisation of the descending colon and the splenic flexure will soon render their anastomosis easy. When, however, it seems likely that this displacement of the descending colon will be needed, it is desirable to carry it out before the intestine is severed so as to be certain of a perfectly aseptic operation field at the time. The end-to-end anastomosis is then completed in the usual way.

For a growth in the rectum the same principles apply. The highest gland in the lymphatic chain, that which lies on the inferior mesenteric artery, must be taken away. Nothing less will do. The inferior mesenteric artery must then be divided, either above or possibly beyond the origin of the left colic artery. The peritoneal incision begins to the left of the upper part of the rectum and the sigmoid, and both these are wiped upwards with gauze towards the aorta. They are rendered mobile before anything else is done. The inferior mesenteric is then divided, the peritoneum incised downwards over the front of the sacrum, the middle sacral artery ligatured, and the sacral hollow wiped clean by repeated applications of gauze, stripping little by little. When this has been done, the amount of freedom which it is necessary to give the descending colon must be ascertained, and be provided. End-to-end anastomosis, when the bowel has been severed, will not always be possible inside the abdomen, for probably only four or five inches of the lower part of the rectum remain. In such circumstances the upper end of the rectum is tied with a stout catgut ligature before division. After the removal of this growth, an assistant passes a pair of forceps into the dilated anus and seizes this tied end of the rectum which is then inverted until the ligatured end can be made to protrude beyond the anus. The upper divided end of the sigmoid is then pulled through the anus with forceps and an anastomosis made by Mannsell's method. Many of the details of this procedure are the same as those laid down by C. H. Mayo (Surgery, Gynecology and Obstetrics, 1906, iii, 240). The essential differences are, that in the method I describe the bowel above is freely mobilised so that easy end-to-end anastomosis is possible, a greater length is removed and the excision of the entire glandular group is ensured. It is probably safe to say that this last,

and I think most essential, feature of the operation has never previously been suggested or adopted as a routine procedure. In the operations generally practised (Mayo's, for example) colostomy is performed too frequently. This serious drawback to the cosmetic attributes of the operation can be avoided, strange though it may seem, by a higher division of the arteries, and by a wider removal of the intestine, provided the principle of displacement of the colon be duly observed.

For low rectal cancer I have never carried out an abdominal operation, but if adequate measures are to be taken to remove the invaded area in accordance with the principles laid down, no other course than this seems rational. Operations which merely go "wide of the disease" do not meet the necessities of the case. We have not yet sufficiently realised that the surgery of malignant disease is not the surgery of organs: it is the anatomy of the lymphatic system. The inherent futility of all purely sacral operations seems to me to be quite evident.

If it is true, as I have endeavoured to shew, that the descending colon and the upper part of the sigmoid flexure retain their vitality after the sacrifice of the inferior mesenteric artery and if the mobilisation of the colon and the splenic flexure permit a considerable displacement of these portions of the bowel, then in all cases of carcinoma of the sigmoid flexure or of the rectum, whether high or low (the proctodeum excepted), an abdominal operation seems desirable, for by this route alone can the whole lymphatic territory be extirpated. The observance of the practice described in this paper should do much to abolish the operation of colostomy as a necessary part of the radical operation for cancer; though it will, of course, always be demanded for those cases in which obstruction calls urgently for relief.

HYDROPS ARTICULORUM INTERMITTENS[1]

BY WILLIAM HEALY, M.D.
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DEFINITION: A chronic affection characterized by an effusion poured out into one or rarely more joints, at regular or irregular intervals, without any ascertained external cause for the recurrences, and without any perceptible anatomic alteration as cause or result of the repeated attacks. The latter part of this definition I take directly from Schlesinger, who wisely ruled out the small percentage of reported cases under this heading which showed definite pathologic changes in the joint as the probable basis of the attack.

The rarity of this disease has been witnessed to by many authors; and up to date, there have been reported only about seventy cases. A personal experience with 750 cases of recurrent effusion into the knee-joint after injury, was recently the subject of a study by Sir William Bennett; but in reporting this large number, he does not even mention any cases showing the remarkable periodicity which is the chief point of interest in the disease under our consideration. It has been suggested that many instances of intermittent hydrops are overlooked by surgeons, but in the light of the negative experience of Bennett and of other authors, as well as some very capable surgeons whom I have personally interrogated, it seems that an affection so easily diagnosed is probably not very frequently mistaken. There are but few, and then quite incomplete, analogies to this affection in the whole realm of medicine; and the interest which even a single case may awaken, can be seen by consulting the literature where we find three extensive monographs, three German University inaugural dissertations, and one Hunterian lecture, besides many long articles written on the subject.

I am able to report the unusual number of

[1] Read before Chicago Neurological Society, November 4.

three cases — one of which in particular, through the intelligence of the patient, the length of time over which I have observed it, and the correspondence of the details to the usual type, offers much that is well worth close study.

Case 1. Keen, intelligent merchant, aged 42.

Family History. Grandfather extremely rheumatic, on crutches for 25 years. Grandmother said to have had "water on knee" for years before she died. Father died at 75; slightly rheumatic, some undiagnosed lack of control of rectal sphincter for twelve years before death. Mother died aged 33 from some infectious disease. Only sister died from diphtheria aged 5. Only brother alive and well.

Previous History. As infant small and in poor general condition. Scarlet fever at 9 years. Never seriously ill since. As youth very well; athletic, especially good jumper. No malaria. Mild attack of blennorrhœa. No lues. Never more rheumatism than slight pains in muscles occasionally. A joint affection began in the fingers in 1891; characterized by chronic swelling of the joints, at first probably some fluid in them, then thickening of tissues about the joint and of the ends of the bones, gradual distortion, no pain except on pressure. This trouble progressively worse till four or five years ago, since then stationary with moderate deformity of thumbs and fingers.

History of Knee Affection. In 1887 had a gradually increasing and persistent swelling of the right knee without much pain. Attributed by patient to jumping off moving train some days previously. Had recovered recently from attack of supposed blennorrhœa which lasted only a week, and was cured by a druggist's prescription. A surgeon was called in to see the knee, tapped it, withdrew the fluid, injected with carbolic acid and put into splint. While on crutches, other knee suddenly swelled and in turn was tapped, injected and splinted. When splints were taken off, knees were found almost immovable and patient was forced to go on crutches for two years, until joints became limber. No more swelling until 1890, when suddenly without known reason, left knee swelled; but this time it disappeared in five days. Recurrence in 11 days, and now periodicity was first noticed by patient. From this time on potassium iodid and some other drugs were given without effect. Finally quinine was tried and the series of recurrences stopped. No more swelling for a year. Then after another series of periodic attacks quinine was again taken. Then no swelling for five years. At this time the right knee was injured in running for a train, and a swelling ensued which last for four or five weeks. Six months later periodic attacks began again, lasting four or five days, recurring regularly in two weeks. Quinine. After a short series no attacks for a year. Then various attacks in short series until 1901 when quinine disagreed with his stomach. Went to Martinsville (Ind.) Springs for several weeks and while there took pills of quinine, iron and strychnia. No more attacks until 1904, when in spite of all previous remedies, attacks become again well established in series every fourteen days and lasting four or five days. After about six months of this I first saw the patient.

Character of Attacks. They begin every fourteenth day with such regularity that patient arranges his business so as to stay at home on that day and for a varying number of days following, according to rapidity of disappearance of swelling. Besides this, he has always been especially careful not to injure nor over-tax his knees for several preceding days. Generalized physical symptoms have never been observed. There is no feeling of cold in legs or feet. No feeling of heat nor redness of skin over knee. Amount of pain very slight, mostly a feeling of tension, and confined to knee; absolutely no pain, if knee not moved. However, knees "never feel quite right." Either knee may be affected, but in no regular alternation. Rarely both knees have been swollen at once. No other joints have ever been affected.

Examination. Well nourished, good color, digestive functions normal. Complete neurologic examination gave negative results. Knee-jerks equal and very lively. Deformed phalangeal joints as already described. Knees show nothing abnormal except great laxity of patellar tendons. Urinary examination negative.

Treatment. Liquor potassii arsenitis in increasing doses. Because of effect on stomach could get no higher than eight drops at a dose.

Result. One slight attack at the regular interval after starting treatment and then no more for two years. One slight attack in spring 1907. Took arsenic. September 5th attack while on vacation, had no arsenic. Another attack September 17th, then took Fowler's solution for a short time. Slight attack in November, no arsenic; and again twelve days later. Then began taking atoxyl, doses half a grain, and expected attack did not occur. Stomach again became affected; patient went to the Martinsville Springs. No attacks now for two months.

Case 2. Mrs. X., housewife, aged 36. Family history: mother had chorea as a child; died at 28 from apoplectic stroke during confinement. Father alive and well. No definite history of rheumatism in family. Patient has two children, both of whom have been treated for chorea at our clinic.

Previous History. Scarlet fever and diphtheria when a child. Inflammatory rheumatism at 13. Much tonsillitis. Always very nervous and "hysterical." Chorea of pregnancy in 1891, ill then for three months. No malaria. No injuries.

History of Knee Affection. In 1899, the right knee became swollen, the trouble not being attributable to injury or to any other cause. After a few days, swelling disappeared. In a short period it came again; and the attacks continued at intervals for six years. Sometimes one knee and sometimes the other was affected; and once both knees were swollen at one time and patient remained in bed for a week. The attacks caused no pain, but much discomfort — it was usually not necessary to keep off the feet. No general symptoms. In some attacks the swollen knee would be several inches

larger than the other one. The swelling lasted, as a rule, three or four days. The patient, who is decidedly unobservant, has never noticed the length of the interval. All sorts of local applications and bandages were tried without success. Patient does not know what medicines were given.

Examination. Seen by me at the Chicago Policlinic, February 10, 1905. Well nourished, good color. Digestion fair. Sleep good. Neurologic examination negative with exception of fine tremor of outstretched hands and tongue. Knee shows nothing abnormal.

Subsequent History. Patient was given Ac. arsenosi $\frac{1}{10}$ grain, and sulphate of quinine, 2 grains t.i.d., and told to come back whenever she had a swelling so that we might try to find out the periodicity. On March 2nd she came back with a very slight swelling of the right knee. On March 9th she returned with a worse swelling which appeared suddenly; and now the difference in the size of the knees was considerable. The patient was not seen again until November, 1907, when she came in response to a letter. She reports that she took our prescription off and on for about two months. After seeing us she had a very few slight attacks which were hardly noticeable and not worth reporting. Has certainly not had any at all for about six months. Examination again shows nothing abnormal in knees.

Case 3. (This case is reported through the courtesy of Dr. M. L. Harris who, knowing that I was investigating the subject of hydrops intermittens, offered me the privilege of reporting the single case which he has observed in his extensive experience. To Dr. S. J. Walker, with whom Doctor Harris saw the case, I am also indebted for some of the details.)

Mrs. X., married, aged 34. Family history quite negative, with the possible exception that her mother was always rather delicate and of a highly nervous temperament.

Previous History. Up to age of 14 was considered quite delicate. Had a number of the diseases of childhood. Since 14 has been quite healthy. Menstruation regular and without any difficulty. Has two children; no trouble during first pregnancy. During the second pregnancy had nine months of almost continuous nausea and vomiting. After confinement was troubled with a severe neuralgia of face and head for several weeks. While in bed at this time remembers having a slight stiffness in the left knee which was so slight that nothing was done about it.

History of Knee Affection. About June, 1904, without any injury or apparent cause, began having attacks of pain and swelling in the left knee which became puffy and red. At first the attacks were not severe, and believing it to be rheumatism, the patient did not pay much attention to them. Gradually they became worse until she was obliged to keep quiet during the attacks and they began to recur at regular intervals of 12 to 14 days. During the attacks the joint would have the appearance of an acute arthritis with effusion. The folds of the synovial membrane could be distinctly felt, thickened and tender. In about two days, as a rule, all symptoms disappeared as quickly as they had come, and the joint would assume a perfectly normal appearance. By palpation then no swelling, thickening or effusion could be discovered and the knee could be used as well as ever.

The patient was seen by various skillful physicians and surgeons who tried many therapeutic measures without avail. At one time a cast was applied, but failed to check the series of attacks. Doctor Harris saw the patient in a number of attacks and finally, following the suggestion of various writers on the subject, gave arsenic, at the same time placing the patient's knee at rest during the attack in a very light cast. This treatment resulted in a complete cure; and the patient now after two years, remains entirely free from further manifestations in the knee.

History and Literature. Cases were described by Perrin in 1845, Grandidier in 1851, and Veillard in 1857, which were afterwards recognized as being intermittent hydrops. However, to C. H. Moore, of London, we must give credit for first studying and presenting typical cases of the disease as such. In 1864 and again in 1867, he published articles which emphasized the peculiar characteristics and especially the periodicity. Perhaps the most important papers coming next, were those of Féré who contributed an article on the history of the disease and reported more cases, viz., five, than any other author has done. Then Benda wrote a thoroughgoing monograph in 1900, including a synopsis of each of the 57 cases reported up to that date. Also in 1903, a monograph appeared by Schlesinger which was published separately and in Nothangel's *Spezielle Path. u. Therap.* In our country Brackett and Cotton presented together in 1901 a summary study with report of two cases. To students of this subject I commend the monographs of Benda and Schlesinger. In the bibliography appended to this article I mention only the later studies not included in their lists, together with the few older important works.

A comparative study of the symptoms, the course and the effectiveness of various treatment is an easy task from the considerable number of well-reported cases, but the chief interest, of course, lies in the etiology of this unusual disorder and it is to this part of the subject that we shall give most attention.

Symptoms. There is a remarkable uniformity about the character of the attacks in different individuals. In most cases there are absolutely no signs of inflammation in the joint,

in the small minority there are slight degrees of heat and redness. The amount of swelling varies greatly in the different attacks. My Case 1 always gauges the onset from the time when pressure of the hand on the side of the knee below the patella, pushes over the fluid and causes a bulging on the opposite side. Occasionally there is no increase beyond this, but often, as in other instances, the swelling can be measured by inches. Authors generally agree that the swelling is limited to the capsule of the joint and that it is a simple, serous effusion, but in at least one case the tissues about the joint were also swollen. Pain varies greatly, as one might expect in a purely subjective phenomenon. In some patients there seems to have been no pain at all connected with the attacks — at most a feeling of discomfort. In others this discomfort is very marked and described as a feeling of tension; and in the remaining few patients there may be actual pain, slight or severe, and be either confined to the joint or occasionally extend up and down the leg. General symptoms and even prodromata have been mentioned, but evidently are distinctly rare. Among the latter malaise, chill, slight fever, and backache have been reported; while during the attack, dizziness, vomiting, and tachycardia have occurred. Polyuria may coincide with the disappearance of the swelling. Function of the joint is usually more or less disturbed — the limitation of motion varying for the most part according to the amount of effusion — although some patients are able to continue at their work.

The time relations of the disease are among the most interesting points. In the majority of cases the swelling begins without warning, except such as previous experience with periodicity may have afforded, reaches its maximum in from one to three days, and takes perhaps a little longer to subside — the attacks, then, lasting from two to eight days. The interval before another swelling occurs varies with the individual, but in most cases is curiously regular. It varies from twenty-four hours, as in one of Marsh's cases, to four weeks. Benda states that there was regularity in the length of the intervals in 42 out of the 57 cases he analyzed. This regularity has in many instances partaken of the almost uncanny predictability described in Case 1, who was subject to recurrences during one period of the disease every twelfth day and at another time every fourteenth day. In the cases which I have found reported since Schlesinger's monograph appeared, the regularity of the periods has generally been a very marked feature.

The phenomena of this disorder have been so frequently limited to the knee-joint, that some authors have called the disease intermittent hydrops of the knee; but in the rarer cases — in 13 out of Schlesinger's 57 — other joints besides the knee show the effusion. The elbow, ankle and maxillary joints, particularly, may be affected with or in alternation with the knee, and even the joints of the spine in one instance showed the disturbance.

The relation of these attacks in women to the menstrual period is generally, but not always, negative; but when there seems to be direct relationship there is great irregularity in different individuals. Attacks may come only at that period, or may be merely severer at that time, or again the slighter attacks may come during menstruation. A so-called "quiet effusion" into the knee-joint in girls is mentioned by Bennett, who has seen over a dozen cases. It begins with puberty, and passes away with the full establishment of the catamenia unless the joint is injured. Then there may be recurrences at intervals. Study of these few suggestive recurrent cases is not offered by Bennett in detail — an essential to classification in our category.

Diagnosis. About diagnosis there can be no difficulty, if a case is properly observed.

Pathology. Examination of the joint between the attacks, is in nearly every case reported to yield only negative results. As I have previously stated, if gross anatomic changes exist which could in any way account for a recurrent effusion into a joint, then the case must at once be ruled out of the category of hydrops articulorum intermittens.

Etiology. As to sex, the cases are about equally divided. Two patients under 10 years of age have been reported; the others range through all decades up to 60. The onset is generally in the young adult. Occupation: Notwithstanding Schlesinger suggested that exposure and strenuous occupation may have

a predisposing influence, it certainly seems that the great majority of cases occur in those who have been under no such conditions. Constitution: As Benda remarks, this affection may be found in both the robust and weakly. Heredity: From this standpoint very little light is thrown. In only one case has there been reported direct inheritance of the trouble, viz., the instance recorded by Blanc where a mother at 22 and her daughter at 17 became subject to the swellings. On the other hand, in many cases there has been a distinct neurotic heredity, as in Case 2, or occasionally as equally distinct arthritic antecedents in the family and the individual, as in Case 1. Relation to sexual life has its chief interest in the important fact that in at least 5 cases the attacks are said to have entirely ceased during pregnancy and part of lactation.

Whether definite infectious or other diseases play an etiologic rôle in intermittent hydrops has been much discussed. Historically, the first consideration was malaria. Moore's original case had suffered from ague some years before the onset of hydrops, but Moore is quite willing to leave the question open in the light of the fact that quinine did not relieve the attacks, which were of 18 years' standing. Recently this question of malarial origin has again been gone into by Marsh, who had the remarkable case which showed swelling regularly every evening. The blood, however, was examined by a no less competent observer than Donald Ross, who found no parasites. The attacks ceased after treatment by quinine. Altogether very few cases indeed show even the remotest connection with malaria, the periodicity showing particularly no direct correspondence. On the other hand, from the standpoint of malaria itself, Ross and Manson (cited by Marsh) each with a vast experience, say that they know nothing of joint troubles caused by malaria. Bennett, however, recently seems to prove by his experience with 18 cases that an injured joint may recurrently swell during attacks of malarial fever.

Some observers have considered gonorrhœa in a possible etiologic relationship. Albert saw the attacks of hydrops occur in a case synchronously with exacerbations of chronic gonorrhœa. In a few other cases, that disorder was present at the time of onset. In one of the older cases quoted by Benda, the attacks followed on gonorrhœal rheumatism; and also in two cases which Marsh quotes Garrod as having seen. Obviously here, also, the connection is too remote to be explanatory.

The joint fluid has been aspirated and examined bacteriologically a number of times, and always with negative results except in one instance where a typhoid-like bacillus was discovered, but no control experiments were done. However, here we must remember that modern pathologists tell us that micro-organisms in joints are usually found in the subendothelial layer and not in the fluid.

With regard to rheumatism, a survey of the literature leads one to agree unqualifiedly with Benda, who maintains that there is no evidence of intermittent hydrops being a form of that disease. The attacks have not infrequently co-existed with rheumatism of various types, as any such long-standing affection may well do; but, as Schlesinger states, a good argument against its rheumatic nature lies in the fact that during the long course of the affection the endocardium remains spared.

The part which trauma plays in intermittent hydrops is not easy to decide. Both popularly and professionally joint disease is so generally attributed to injury, that it is no wonder we often find recorded some accident received previous to the first attack. As in my Case 1, however, the etiologic connection is rarely convincing. Also as in that instance, only one of the supposedly injured knees may be swollen at first. This patient also shows correspondence to another feature of several recorded cases, inasmuch as the joint once affected by intermittent hydrops is apt to show peculiar susceptibility to slight injury, resulting either in a regular series of attacks or in a more persistent swelling. This whole question has also a strong negative side, when we consider that most of the cases recorded present no history of a definite injury causing the first attack — while such causation for each of the succeeding attacks in their definite intervals is an absurd consideration. Indeed, on the other hand, in a minority of the cases the patient has been sure that there was never the slightest trauma preceding the first or any other attacks,

the latter often coming on while the patient was purposely resting.

Authors who have studied the collected material are all persuaded of the kinship of intermittent hydrops to nervous disease — although the forms of the latter, as manifested in the patient or his progenitors, may have taken widely diversified forms. A considerable number of the subjects are reported as severe sufferers from neurasthenia or hysteria. Féré reports three of the latter and one of early dementia paralytica. One recorded case had migraine, two epilepsy, three Graves disease — one of the last curiously alternating the appearance of hydrops with disappearance of the major disease. Senator's case suffered from traumatic neurosis. Another patient was subject to periodic vomiting and periodic swelling of one hip, and still another to periodic diarrhœa. One patient was a hypochondriac; another, a morphinomaniac, had the joint swellings when abstinence from morphine was enforced. The tachycardia reported as occurring in attacks is also held to be a nervous phenomenon. Intermittent hydrops shows a peculiar amenability to psychic influence; Féré and Breslauer had each a case which demonstrated the joint effusion after mental excitement. Schuchard's case missed an attack when an operation was planned. Benda's case was certainly healed and several others were modified by suggestive methods.

To one who regards with favor the theory that arthritis deformans is at base a nervous affection, the appearance during this rather rare disease of intermittent hydrops is significant — it occurred in certainly three out of the seventy cases, while four more had some chronic joint changes.

The closest analogy to intermittent hydrops in the whole realm of medicine is found in Quincke's acute circumscribed cutaneous œdema, and Quincke himself recorded a case with the two affections in one patient. Benda found reported one case of urticaria, and five cases in which there was swelling of the skin about the knee simultaneously with the hydrops. Olser and Joseph Collins have both been careful students of Quincke's disease. They call attention to the fact that it is often found in neuropaths and sometimes with Graves disease. Frequently it has been noted that occurrence of the swelling in one spot seems to predispose the place to future attacks. Both agree that periodicity may be a remarkable feature of the skin swelling. Osler cites the case of Matas in which the swelling came on every day about noon, and one of his own in whom there was intense swelling recurring every three or four weeks. However, from our present standpoint the most interesting case of Quincke's disease which I have found is recorded by Jamieson in 1883. He described a female patient of previous good health who at 53 began to suffer from arthritis deformans which progressed until there was distortion of many joints. After six years this became quiescent. During all this period and continuing afterward she was subject to sudden severe subcutaneous swellings, particularly prone to attack her eyelids, quite closing the eye, or her lips. At first these attacks recurred at intervals of about four weeks, then after some years they came once a week, particularly on Sundays. The swelling disappeared inside of three days, and its presence caused only a feeling of tightness. He found treatment with blisters and the administration of arsenic most beneficial. Notwithstanding the obvious differences surely all this likeness between the two diseases makes out a strong case for recognition of them both as vasomotor neuroses.

Pathogenesis. The fact that the knee has the most complicated and by far the largest synovial surface, explains its peculiar liability among the joints to any secretory disorders.

An instructive study of the whole question of the origin of effusion into joints is lately presented by Hildebrand. He describes the tremendous network of blood vessels supplying the capsule and synovial membrane, particularly of the knee-joint, and emphasizes the fact which several anatomists have corroborated, viz., that the blood-vessels, even the smallest arterial branches, are extraordinarily well supplied with medullated nerve fibres which enter the muscularis, and that all the smallest transitional vessels and capillaries are supplied with non-medullated fibres. Thus there exists, under the influence of the nervous

system, a thoroughly distributed and delicate mechanism capable of readily altering or restoring the normal secretory conditions. Hildebrand also tells of the peculiarly rich nerve supply to the serous surface itself. The nerve endings are there largely composed of special sense-bulbs. He suggests that through this mechanism irritations which might neither be felt as such nor cause gross anatomic alteration could readily by reflex action produce a transudate. Bennett corroborates this from the clinical standpoint in telling of his 56 cases of non- traumatic effusions following old injuries. He opened 12 of these joints, and among them found five with no internal derangement whatever. He classifies such as abnormal joints which respond with effusion to very slight repeated injuries which are not noticed. This type of case may, if Bennett's ideas are right, claim some which are now called hydrops intermittens; but such instances as Case 1, with effusion recurring while the patient is purposely resting are beyond his classification.

In a study of the etiologic rôle of the vasomotor centers in the production of angioneuroses, etc., Polland states his belief that the many cases of circumscribed cutaneous œdema, which are reported occurring with tachycardia, prove an abnormal excitability of the vasomotor center in the medulla. Perhaps the occasional concurrence of tachycardia with hyrdops might lend his hypothesis some value for us.

How to account for the periodicity. Well, Benda meets this in Yankee fashion by asking another question: How does one account for the whole list of biologic and pathologic periodic phenomena — for periodic psychoses, periodic epilepsy, for menstruation and periodic migraine?

Barker's suggestion that perhaps the effusion may be connected with lowered coagulation-time of the blood seems rather out of the way in light of the periodicity and selectiveness of location of the swelling. At any rate, these periods would greatly complicate examination of coagulation-time which is on none too sound a clinical basis now. It used to be thought that potassium iodid increased the coagulability of the blood. I do not know that this has been proven by modern research, but my observation, whatever its worth, is that Case 1 developed a new series of attacks while under treatment with considerable doses of potassium iodid.

Prognosis. Moore's original case was lost sight of after 18 years subjection to the attacks. Kamp very recently records his patient who for years has absolutely resisted all treatment. Against these and the many other pessimistic records we can balance the reports of a few brilliant cures and some other instances of marked improvement. The cases seen by American authors have, for the most part, been especially tractable to treatment.

Treatment. Nearly everything that can be imagined in the way of external local treatment has been tried — bandaging, fixation, all sorts of medicated applications, ferrum candens, blisters,— and pretty much to the same purpose, most of them having no effect at all, while occasionally some one measure seems to interrupt the cycle of attacks. But we must estimate even this modicum of success by the fact that some cases have been found liable to spontaneous betterment. Then, also, the experience of Case 1, in having the trouble banished from one knee only to appear in the opposite joint has several times been recorded, especially after operative procedures.

Internal treatment of the joint by aspiration and injection or by free opening and washing has rarely yielded good results and, therefore, is certainly contraindicated except as a last resort. In the light of published facts one is surprised that surgeons care to recommend so radical an undertaking. If there are no anatomic alterations to be found, as surgeons have maintained, then very likely any possible good results from operation are merely achieved by suggestion.

Psychic conditions, however, have been shown to be powerful factors in inducing attacks, in aborting them and even in curing the disease, therefore any legitimate suggestive treatment is certainly in order for amenable patients.

Many internal remedies have been exhibited and mostly without avail. However, there are two drugs, quinine and arsenic, which have shown some reliability. The use of the former

rests partly upon a theoretical basis inasmuch as it acts as a vasoconstrictor on the vessels of the joints. It is difficult to exactly determine from the literature the statistical value of these remedies, but evidently quinine may be credited with three cures and two satisfactory improvements, while arsenic apparently cured six and improved one. The latter proved beneficial in some cases which resisted the effects of quinine. Both drugs and especially the arsenic are best given in doses which prove moderate for the individual and over a prolonged period.

BIBLIOGRAPHY

Barker. Jour. Amer. Med. Assn., Feb. 2, 1907.
Benda. Allg. med. Central-Zeitung, 1900.
Bennett, Sir Wm. Lancet, 1901, and Jan. 7, 1905.
Blanc. Lyon Med., 1897.
Brackett and Cotton. Boston Med. & Surg. Jour., Oct. 31, 1901.
Collins, Joseph. Amer. Jour. Med. Sciences, 1892; Reference Hdbk. Med. Sc. etc.
Féré. Rev. neurolog., 1893. Rev. de Chirur., 1898, No. 18
Hildebrand. Archiv. für Klin. Chir., Bd. 81, p. 412, 1906.
Jamieson, W. A. Edinburgh Med. Jour., June, 1883.
Kamp. Deutsche med. Wochenschrift, No. 12, 1907.
Kennedy. Jour. Amer. Med. Assn., 1894.
Marsh, Prof. Howard. Hunterian lecture, Lancet, June 4, 1904. Trans. Clin. Soc., London, 1905; Lancet, April 22, 1905.
Moore, C. H. Lancet, April 30, 1864; Trans. Roy. Med. & Chir. Soc., vol. l, 1867.
Osler. Amer. Jour. Med. Sciences, April, 1888. Jan., May, 1904, etc.
Oppenheim. Lehrbuch der Nervenkrankheiten.
Polland, R. Zeitsch. f. innere Med., No. 2, 1907.
Quincke. Monats. f. prak. Derma. u. Syph., July, 1882.
Rhode. Monograph. Greifswald, 1903.
Schlesinger. Monograph and Nothnagel's Spez. Path. u. Therap., Bd. vii, 1903.

SYNCYTIOMA OR CHORIOEPITHELIOMA OF THE PLACENTA

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THE following case presents symptoms of clinical interest, and suggests for discusion several points of practical importance:

Mrs. T. M., primipara, was admitted to the Maternity Department of the Jefferson Hospital, December 14, 1907. Her family history was negative, with no history of cardiac, renal, tubercular, or malignant disease.

She had measles and pertussis in childhood; menstruation was irregularly established, and continued irregular at intervals of from four to eight weeks. Very little pain accompanied it.

During pregnancy she had nausea and vomiting for the first two months, and afterward was fairly well. When she first came under observation the uterus was three fingers' breadth above the umbilicus, heart sounds were heard in the left lower quadrant, the placental sound was not heard, the fœtus was in first position, vertex presentation, and the pelvic measurements were normal. The urine contained a thin cloud of albumin, but was otherwise normal.

The patient was delivered of a still-born child on December 14, 1907. There was very slight laceration, which was immediately repaired. The labor was unusual from the occurrence of hemorrhage, which preceded and accompanied the birth of the child. There was no placenta prævia, and the source of hemorrhage seemed to be a premature placental separation. The child was still-born, weighing 3 pounds, 14½ ounces.

According to the patient's history, she was at least nine months advanced. The child had no apparent abnormalities and was not macerated. Its length was 41 cm., its proportions normal for its length and weight. On making efforts to establish respiration with forced expiration, bloody serum came from the mouth and nose. An autopsy could not be obtained.

The placenta weighed 11½ ounces, was intact, the length of the cord, 42 cm.; the cord was laterally inserted, bloodless and shrunken. The placenta was evidently abnormal, containing several areas of grayish-pink sponge-like substance. It was sent to the Pathological Department for minute examination. The report of the Laboratory is as follows:

The specimen is a placenta, measuring 16.5 by 10 by 2.5 cm., and weighing 267 gms.

The umbilical cord, attached at the periphery, is 35 cm. in length and .5 cm. in thickness.

On the fœtal aspect of the specimen the vessels are large and tortuous, and the surface is covered by a thin, transparent, smooth and glistening membrane beneath which is a corrugated, reddened surface.

The maternal side is for the most part dark red in color; in some areas it is rather firm, circumscribed, and slightly elevated, appears spherical, is greyish-pink, and varies from 1 cm. to 2 cm. in diameter. These

places cut with little resistance; the incised surface is greyish-pink, very granular and sponge-like. The areas just described, extend into the underlying substance for a distance of .5 cm.; some appear to possess a capsule which is less than 1 mm. thick, fairly adherent and pinkish red.

The placental substance is rather soft and flabby, and cuts with ease; the incised surfaces are dark red, spongy, rather moist and ooze blood. On the fœtal membrane .5 cm. from the margin, is an isolated mass of placental tissue, 4.5 cm. in diameter. It presents nothing different from other parts of the placenta; 3 cm. from one margin of this mass and 1 cm. from the placental margins is a nodule in the fœtal membrane 1.9 x 2.2 x 0.5 cm.; it is firm, resistant, evidently between the chorion and amnion, and cuts with little resistance; the incised surfaces are greyish-white, spongy and very coarsely granular. The amnion is smooth and glistening. The chorion is rough and contains fragments of reddish-pink tissue.

Cubes were fixed in Heidenhain's solution, embedded in paraffin, and stained with hematoxylin and Van Gieson.

Histology. The conspicuous feature of these sections is the chorion; it is not limited to the margins of all the sections but penetrates the underlying structures as wide bands, and at some points is found in large circular masses. It is composed of many cells and an intercellular substance. The elements are large, as a rule polyhedral, and sometimes oval. The nuclei are ovoidal, central, poorly staining, transparent and reticulated; the meshes contain a few chromatin granules. The protoplasm is abundant and rather feebly staining and very granular. These cells are enclosed by the intercellular substance. At no place does no alveolus contain more than five or six cells, frequently but one. The arrangement is much like the cells in cancer. The intercellular substance is not fibrous tissue; its morphology and tinctorial properties resemble keratin, although it is somewhat granular. The chorionic tissue at some points shows extensive necrosis, disintegration, and among the fragments of tissue there is considerable blood. In the necrotic tissue the outlines of the alveoli are clear, but their contents cannot be identified. In a few sections, the chorionic tissue is limited to the margins. The villi vary in size; in structure they are similar to those in normal placenta except that in some the layer of Langhans, the syncytial strata and the cell balls are absent. In others the syncytium can be identified, and in still others only the cell balls are seen. The vessels of the villi vary in size, but all are filled with fairly well preserved erythrocytes. The margins of the villi are well bathed with blood.

Diagnosis. Chorioepithelioma or placentoma.

The patient's puerperal period was not complicated by infection, nor did hemorrhage recur. She was evidently anæmic, and the blood count showed hæmoglobin 55 per cent, red cells 4,140,000, leucocytes 10,200. Under treatment addressed to the correction of this anæmia, the hemoglobin increased to 64 per cent, the red cells to 5,140,000, the leucocytes diminished to 5,840.

Vaginal examination at the close of the puerperal period showed the uterus fairly well involuted, the cervix very slightly lacerated, the pelvic floor and perineum sound, and a very slight dark bloody discharge from the uterus.

In view of the pathological findings in the placenta, dilatation and curetting were performed under ether one month after the birth of the child. The uterus was more soft than normal, dilating readily, and abundant spongy endometrium was brought away by the curette. The scrapings were carefully preserved and sent to the laboratory. The patient made an uninterrupted recovery from the curetting, involution became complete, and the patient's general health steadily improved. No abnormality in the pelvic organs could be discovered when the patient was examined under ether.

The laboratory examination of the scrapings showed normal endometrium with no evidence of malignant disease.

Upon receipt of the result of the examination of the placenta, it was first determined to subject the patient to hysterectomy, and she gave her consent to this operation. It seemed, however, possibly not justifiable to sacrifice the uterus because of the diseased condition of the placenta, especially as I could find in the literature of the subject no precedent for so doing. Accordingly, it was determined to curette the uterus instead, and if the scrapings proved malignant, then to perform the hysterectomy. As the scrapings showed no sign of malignant disease, the patient was discharged.

In addition to this case, the writer has reported the case of a multipara pregnant a few months, suffering from pernicious nausea. Other treatment failing, the uterus was emptied under ether. The patient grew worse, complaining of severe headache, and died a few weeks after operation. Autopsy showed chorioepithelioma in the important viscera of the body, the pelvic organs remaining normal.

In a third case, the patient died after abortion from persistent oozing hemorrhage, which could not be controlled. Packing with adrenalin solution temporarily stopped

the bleeding, which returned when the packing was removed. The uterus was slightly enlarged, soft, and dark red. There was, however, no distinct evidence of malignant disease, and no autopsy could be obtained.

So far as could be judged, the patient's death resulted from cardiac syncope. There were no definite symptoms, and in the absence of an autopsy it could only be surmised that the case was one of chorioepithelioma.

Examination of the blood and urine were negative, with the exception of demonstrating a profound anæmia.

The literature of the subject is so extensive that we quote only a few of the most recent papers.

Eden reports a case of chorioepithelioma of the vaginal wall and of the body of the uterus treated by radical operation. Death followed, and autopsy showed abundant metastases. There was no clear history of pregnancy or recent abortion, except that of repeated hemorrhage.

In discussing the theory of the growth, it is thought to be of teratomatous origin, possible in both male and female, and in view of this fact, not necessarily connected with pregnancy. Pick's case in a girl 8½ years old; Landau's 5 cases in girls from 16 to 24 years of age; Schlagenhaufer's 2 cases of chorioepithelioma of the testicle in the male subject; Emanuel's collection of 14 cases show that the tumor may occur in both sexes independent of pregnancy.

Devitzky reports from the clinic at Moscow, a typical case in a woman, aged 75 years, who had never been pregnant. This, and the preceding cases show the independence of the disease as regards pregnancy.

Schmauch (Surgery, Gynecology and Obstetrics, September, 1907) gives an extensive review of the literature of the subject in which I find no mention of disease of the placenta. He believes that there is only a gradual difference between the simple invasion of the uterine muscles by villi and their sequelæ, such as adherent placenta, placental polyps and moles, between the localized chorioepithelial growths, limited to the uterus and placental region, and villous infarcts developed by deportation of villi; and finally, between those cases in which the lungs were able to dispose of scattered fœtal cells and the typical chorioepithelioma malignum which becomes generalized by metastases. He believes that the term "malignant chorioepithelioma" should be limited to localized growths of chorioepithelial character, villous infarcts, and the typical tumor.

He summarizes briefly 206 cases, in a few of which the fate of the patient is not specified. With very few exceptions, the result was uniformly fatal for the mother. There is no mention of the fate of the infant in cases occurring after viability.

An analysis of this and other cases shows that in most patients the disease manifests itself in the first four months of pregnancy.

Sternberg reports an interesting case of chorioepithelioma of the cervix in which decidual cells from the uterine decidua could be demonstrated.

Swayne reports two cases, one of which recovered apparently after vaginal hysterectomy, and the other died with metastases in both lungs. Both followed early pregnancy.

Stone summarizes 22 papers upon the subject, quoting Teacher's collection of 188 cases, of whom only 19 were at full term, with a mortality rate of 63.6 per cent. He reports the case of a young woman with irregular menstruation, examined by a physician who, finding a persistent flow, advised curetting. The scrapings were diagnosticated as sarcoma, and an abdominal hysterectomy was performed. The patient recovered.

The operator who performed the hysterectomy was not informed concerning the history of the case, and on studying the case more closely, recognized his mistake. Re-examination of the slides showed that chorioepithelioma, following abortion, had been present. But two spontaneous cures were authentically reported; while the mortality among the cases operated upon by hysterectomy is estimated at from 59 to 63 per cent.

That chorioepithelioma of the uterus may coexist with lutein cysts in the ovaries is demonstrated by Blacker in a case operated upon at the University College Hospital.

Hicks collected 14 cases of primary vaginal growth, and reports one himself. The

pregnancy had advanced to five and a half months. The patient died from metastases.

He appends a table of the 14 cases of vaginal growth which he has collected.

That chorioepithelioma may be accompanied by hæmatometra is illustrated by a case reported by Griffith and Williamson. Here coagulated blood occluded the cervix, hemorrhage continued, the uterus becoming greatly distended. The ovaries contained lutein cysts.

Garkisch reports chorioepithelioma between the layers of the broad ligament upon the left side. Although the uterus was removed with its appendages, the patient died with pulmonary metastases. The uterus was not involved, and the origin of the growth was thought to be the isthmus of the Fallopian tube.

The coincidence of lutein cells in both ovaries, with chorioepithelioma of the uterus, is further emphasized by Blacker. He reports the case of a multipara who had chorioepithelioma of the uterus and vagina. After operation the patient suffered from hemorrhage, with rise of temperature to 102 degrees F., and rigors. She had cough and expectoration of blood, but finally recovered.

Vineberg reports two cases, the first having the characteristic uterine growth, and the patient recovered after hysterectomy.

The second case was treated by curetting, making at the time a very good recovery. The uterus, however, continued to increase in size, and hysterectomy was successfully performed.

Klinge reports a case which recovered after the extirpation of the uterus by the cautery. The patient had the characteristic uterine growth, with hemorrhage and typical symptoms.

A most interesting review of the pathology of the condition is given by Risel. The bibliography of 264 papers is reviewed, and attention is called to the doubt which has existed as to whether the tumor was maternal or fœtal in origin.

The relation between pregnancy, abortion, the occurrence of mole, and ectopic gestation, is tabulated from the analysis of the papers of Ladinski, Teacher, and Briquel, aggregating 533 cases. Of these, between 36 and 41 per cent followed molar pregnancy; from 22 to 28 per cent normal gestation; from 31 to 33 per cent abortion; and from 2.3 per cent to 3.7 per cent ectopic gestation.

While attention is called to epithelial proliferation and to the growth of syncytial tissue, no distinct mention is made of the recognition of these masses in the placenta itself.

Kroemer's paper contains an interesting statement concerning the malignancy of the growth. In the clinic at Geissen, during seven years, 3856 cases of pregnancy were under observation, among whom 3,841 had normal development of the ovum, 15 had vesicular moles, and 299 had abortion. From those in which the embryo developed normally as far as pregnancy went, there were 2 fatal cases of metastatic chorioepithelioma. Among the vesicular molar pregnancies, numbering but 15, there were 5 cases of chorioepithelioma, all of whom recovered after one or several curettings. When all the cases of pregnancy were considered, the mortality from this cause is estimated at .18 per cent: when the embryo developed normally, at .05 per cent; and when molar pregnancy developed, at $33\frac{1}{3}$ per cent.

We desire to raise for discussion three points: 1. The importance of examining, in all cases where pregnancy is interrupted after the fourth month, the placenta as far as possible. While we have failed to find distinct mention of placental involvement in this disease, we cannot believe from our knowledge of its genesis and growth that the placenta is not involved.

Ballantyne's statement that the placenta is the key to fœtal pathology should be kept in mind in all cases where the fœtus is still-born, or where pregnancy is interrupted after the placenta is formed. Theoretically, this growth should begin in the placenta from chorionic villi, and the examination of the placenta, and the finding of this growth would indicate that the patient had resisted the disease during the early period of gestation and that the growth had possibly become localized in the placental tissue. Should the placenta be abnormal and found to contain chorioepithelioma, the attention of the obstetrician must be immediately directed to the study of the mother.

All cases of pregnancy complicated by anomalous hemorrhage must arouse the suspicion of chorioepithelioma malignum. In

the first case reported, the one abnormality in labor was hemorrhage, which suggested placenta prævia, or accidental separation of the placenta. The latter was indeed present, but the cause of the separation was chorioepithelioma.

If a diagnosis be made of chorioepithelioma from examination of the placenta, what is the duty of the obstetrician as regards the future health of the mother? While it is perfectly possible, as Kroemer has shown by a series of between 3,000 and 4,000 cases of pregnancy, with but 7 cases of chorioepithelioma, 2 of which proved fatal, for spontaneous recovery to occur, one must remember the comparative mortality of those cases allowed to go without operation, and the mortality of those subjected to hysterectomy and other operations. The literature of the subject shows but 2 accurately reported cases of spontaneous recovery — a very large mortality.

In 96 cases subjected to the operation of hysterectomy, a mortality of 63.6 per cent followed — the lowest mortality estimated as following operation being 59 per cent. The cases subjected to operation, however, have been those in which a definite change in the uterus or its contents, as shown by curetting, could be demonstrated. We must remember that fatal cases occur in which the uterus is not involved.

Shall the operator who detects chorioepithelioma of the placenta proceed immediately to hysterectomy as soon as the patient's condition justifies it, or shall he content himself with a thorough examination of the patient under ether, including curetting, and the microscopic examination of the scrapings?

If these procedures give no evidence of chorioepithelioma, is he justified in allowing the patient to pass from observation without hysterectomy?

BIBLIOGRAPHY

BLACKER. Jour. of Obstet. and Gyn. of the British Empire, June, 1907.

BLACKER. Trans. of the Obstet. Soc. of London, 1907, [illegible] 184.

DEVITSKY. Meditsinskoe Obozrenie, 1904; No. 5, [illegible] 85.

EDEN. Jour. of Obstetrics and Gynæcology of the British Empire, Dec. 1907.

GRIFFITH AND WILLIAMSON. Jour. of Obstet. and Gyn. of the British Empire, Aug. 1907.

HICKS. Jour. of Obstet. and Gyn. of the British Empire, Aug. 1907.

KLINGE. Monatsschrift für Geburtshülfe und Gynäkologie, b. 25, h. 3, 1907.

KROEMER. Deutsche Med. Wochenschrift, No. 31, 1907.

GARKISCH. Zeitschrift für Geburtshülfe und Gynäkologie, b. lx h. 1, 1907.

PICK. Berliner Klin. Wochenschrift, No. 7, 1904.

RISEL. Ergebnisse der Allgemeiner Pathologie, Ostertag and Lubarsch, 1907, p. 928.

STERNBERG. Zentralblatt für Gynäkologie, No. 48, 1907.

STONE. Amer. Jour. of Obstetrics, Oct. 1907.

SWAYNE. British Med. Jour., Aug. 24, 1907.

VINEBERG. Amer. Jour. of Obstet., June, 1907.

IV. THE DAWN OF MODERN MILITARY SURGERY

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THE dawn of modern military surgery was foreshadowed by the epoch-making teachings and example of men like Hilden, Baron Larrey, and others, who took an active part in the fierce wars of the latter part of the eighteenth and the beginning of the nineteenth century. The blind faith in ancient authorities and the handmaid of ignorance, superstition, gradually vanished before the onset of reason and critical thought. During this time, the character of gunshot wounds remained about the same, as few improvements were made in firearms and projectiles. While military surgery became more and more rational, the results of improved methods of wound treatment, a corresponding betterment of wound healing was not realized. Suppuration, pyemia, erysipelas, gangrene, secondary hemorrhage, hospital gangrene, claimed their victims, as heretofore, under less skillful treatment.

Let us now inquire into the methods of treat-

ment of gunshot wounds during the Crimean War, in the beginning of the second half of the nineteenth century. It was one of the most desperate and cruel wars the world ever witnessed. It has been my good fortune to have seen the endless earthworks around the city of Sebastopol, the vast barren plain of Inkermann, the little city of Balaclava, and the very spot where the famous eight hundred met their fate, with cannons spitting fire and destruction in front of them, and from the low bluffs to the right and to the left of them; and the acres of cemeteries where thousands of heroes have found their final resting-place. It was during this war that climate, deathly epidemics, and the most dreadful forms of wound infection combined to decimate the ranks of the besieged and the besiegers, and made up a picture of misery and suffering almost unparalleled in the history of civilized warfare. Nicholas Pirogoff, the distinguished Russian surgeon, served fourteen months in and around Sebastopol, and witnessed all the horrors of purulent edema, pyemia, hospital gangrene, and erysipelas.[1] The prevalence of these, the gravest forms of wound infections, and their spread from patient to patient, from hospital to hospital, and from place to place, caused Pirogoff to assume the existence of a miasm which he believed could be carried in the clothing and dressings and on the hands and instruments. He enforced segregation of the infected and their attendants, and insisted on thorough ventilation of the hospitals. Instruments, charpie, and other dressing materials were likewise kept from being exposed to the miasm. He forbade surgeons to explore gunshot wounds with the finger. All of the dressings were burned after use. That these precautions against infection, established on a rational basis, contributed much in lessening the frequency of wound complications we can readily conceive; but we know why they did not suffice in eradicating them. He condemned the use of hair mattresses in war, as he considered them carriers of disease. He insisted that the infected cases should not return to their quarters so soon after recovery, for fear that they might carry the contagion with them. He considered the contagiousness of wound infection as established, but admitted that the period of incubation had not been determined. He has seen erysipelas and pyemia as endemic diseases affecting isolated parts of an army, while others were free from these diseases. He defines war, from a medical standpoint, as "a traumatic epidemic." His great experience as a military surgeon, his accurate observations, and his logical reasoning brought him to the conclusion that the war department, and those who are directly concerned in the management of a campaign, are directly responsible for many of the diseases which afflict armies, a claim which modern experiences in warfare have well established. Pirogoff made a careful and extensive study of the deformation of bullets, and gives a lengthy description of their varieties and causes.

George H. B. Macleod, who participated in the Crimean War on the English side, made some very interesting and valuable observations on gunshot wounds.[2] He opens the subject with these significant sentences: "The new philosophy has dispelled the mystery, but left us still to study the eccentricities which so often mark these injuries. The contused appearance and unavoidable sloughing of the walls of the ball's track, the little suspected but serious destruction of deep parts, and the grave consequences which may ensue from such a wound, appear to have been the circumstances that suggested the envenomed nature of gunpowder, and the cautery-like action of its projected balls, as well as the idea which prevailed that, in order to get quit of the injurious influences thus exerted on the wound, it was necessary to pour into it burning oil, or curious mixtures concocted from the most opposite and absurd ingredients, or to smear the part with nauseous grease and "charmed salves."

In describing the appearance of the wounds of entrance and exit, he says, if the speed of the bullet is great, and no bone has been struck, then they are nearly alike; but if the flight of the bullet is so far spent as to be retarded by contact with the body, especially if it has encountered a bone or a strong aponeurosis, so that the speed is considerably diminished

[1] Gunshot [illegible] Crimean Kriegs [illegible]

[2] Notes on the Surgery of the War in [illegible] Remarks on the Treatment of Gunshot Wounds, 1858.

before it passes out of the body, then the wound of exit will considerably exceed in size the wound of entrance. This is especially true of conical bullets. He attributed the frequency of suppuration of gunshot wounds to muscle contusion, but admits that, in exceptional cases, healing in such instances can take place by primary intention. Conical balls are more destructive to bone than round bullets, causing a greater amount of comminution. Nerves and arteries are more likely to escape from the ball than veins. In speaking of the freaks of bullet deflections, he says: "I have known it to enter above the elbow and be removed from the opposite axilla."

Foreign bodies in wounds are very common and of the most heterogeneous kind. As the result of his experience, he became partial to the precept of Begin, who argued in favor of early extraction of the bullet. In support of this practice, he alludes to the observations of Hutin, the chief surgeon of the Hôtel des Invalides of France, who saw 4,000 patients who had a ball lodged in the body, and of these only 12 were without complaint, and in 200 of these the wounds opened and closed until the foreign body was extracted. Foreign bodies carried by the ball into the tissues often do the most harm. He is full of praise for chloroform anesthesia as a valuable aid in the examination of gunshot wounds and removal of bullets.

The following method of primary dressing of gunshot wounds was employed by the English surgeons: "The stuffing in of great tents was, I need not say, unknown; and though we ascribed wondrous virtue to cold water, it was not on account of any 'magical or unchristian' power which we supposed it to possess. Water dressings, and the lightest possible bandaging consistent with the fulfilment of well-understood ends, were prevalent in our army, but not to the same extent among our allies, who have not yet given up the weighty pledgets of charpie and much fine linen, which so greatly astonish our English surgeons."

During the Crimean War, light cold-water dressings were employed on both sides as the principal covering for wounds. Oil, wine, spirituous lotions, salves, and plasters, formerly so constantly in use, were forsaken for the simplest kind of local treatment. Pirogoff protested against the use of the finger as a means of exploration of wounds, but the equally dangerous probe remained in constant use. The search for bullets and other foreign bodies and loose fragments of bone was kept up unremittingly. This meddlesome surgery, and the absence of anything like antiseptics in the treatment of wounds, account for the many grave wound complications which made the field hospitals veritable pest-houses. Air simple, and air contaminated with the effluvium of the infected in the crowded hospitals, were looked upon as the essential agents in the causation of the fatal disasters of the wounded, and led Pirogoff to argue in favor of small hospitals. In the mean time, the German military surgeons were given ample opportunity to study the effects and treatment of gunshot wounds. At the head of the progressive men of that time stood Stromeyer, who wrote extensively and most intelligently on military surgery.[1] In speaking of the improvements of firearms, their increased range and accuracy of aim, he expressed the belief that with the forging of rifled cannon further inventions would come to an end. He laid down many maxims which hold true to-day. One of these was to the effect that the harder the material of which the projectiles are made, the greater their destructive effect; and another, the difference in the character of the wounds inflicted depends solely on the caliber of the bullet. Conical bullets flatten the same way as round bullets when they strike bone. Probably the conical bullet displaces large vessels and nerves more than the round bullet. Dupuytren and Blandin claimed that the wound of exit is not always larger than the wound of entrance, an opinion which Stromeyer strongly indorsed. He says, if the bullet does not strike any hard object and passes through the soft tissues the wound of exit may be a simple slit in the skin. A bullet passing through muscle tissue carries away fibers which, when gathered, as was done by Simon, correspond with the size of the track made by the bullet. The hole made by a bullet in aponeurosis and elastic tissue is smaller than in muscles and skin. Round tendons are displaced by the bullet except when

[1] Kriegsheilkunst, L. Stromeyer, 1861, 2d ed.

they are fixed in a groove. The only tendons Stromeyer saw severed by a bullet was the long head of the biceps in the bicipital groove and other tendons similarly immobilized. He believes cerebral commotion is more likely to be produced by bullets which have lost their force than in their rapid transit, as shock is less when the skull is fractured. For the hyperesthesia following gunshot injuries of nerves, he has found the ointment recommended by Professor Schrörer, of Freiburg, very satisfactory. This ointment contains marrow of ox-bone, lard, and sweet cream. The relatively rare occurrence of hemorrhage in gunshot wounds he attributes to the elasticity of the arteries which are pushed aside by the bullet, and to the lacerated condition of wounds of arteries, as is seen to best advantage in injuries inflicted by common balls. Aneurysmal verix is prone to occur if a small bullet injures an artery and adjoining vein at the same time. The small copper bullet used by the Tscherkessen, which weighed only 120 grains, splintered bone as extensively as the large caliber lead bullet of the Russians, a fact first observed and described by Pirogoff. Stromeyer states that a bullet can penetrate one of the large long bones without splintering, and cause lateral defects without producing fracture. Cold-water dressings constituted, at that time, the orthodox local treatment; and venesection was frequently practiced, with a view of preventing or modifying subsequent inflammatory reaction. Stromeyer in all his extensive experience never saw a gunshot wound heal by primary intention. He saw wounds of soft parts heal in eight to fourteen days, but he does not call this healing by primary intention. He regarded the entrance of air and oxygen into wounds as the real cause of inflammation and putrefaction. He never observed a case of hospital gangrene among the wounded soldiers, and believes this disease has become very rare since water dressings have taken the place of charpie. He is opposed to the practice of Bilgür and Baudens, who made large incisions in gunshot fractures for the purpose of resecting the fractured ends, as he considers such a procedure very dangerous, and emphasizes the necessity of treating such fractures in the same conservative way as a simple fracture. Stromeyer was conservative in the matter of searching for bullets, and insisted that young surgeons should not be furnished with a probe, as he was opposed to meddlesome surgery, and placed great stress on rest, general and local, in the treatment of all gunshot injuries.

The Medical and Surgical History of the Civil War deals with the last great war during which the wounded were treated on the same principles as laid down by Stromeyer. Water dressings were in general use. Primary amputation or resection was the rule in all grave gunshot wounds. Suppuration was the rule; healing by primary intention the exception. Resection of any of the large joints was attended by a frightful mortality. Pyemia, erysipelas, and hospital gangrene were rampant, and claimed thousands of our brave soldiers. It was the last war during which hospital gangrene prevailed to an alarming extent. It was in the treatment of this disease that one of the strongest antiseptics, bromine, finally came into use, and yielded excellent results. Hospital gangrene was first described, as a special form of wound infection, by La Motte at the beginning of the eighteenth century; and a treatise on it was found in the posthumous writings of Poteau, in 1783. It was called hospital gangrene, because the disease prevailed mostly in military and crowded civil hospitals. In 1824, of 22 cases of amputation performed in the Hôtel Dieu, Paris, every one of the patients contracted the disease. All the large civil hospitals in Europe were invaded by the disease; and the slightest injuries and most insignificant operations often proved fatal from this complication. A very minute description of hospital gangrene is to be found in an English text-book on military surgery, which was in the hands of many of our surgeons during the Civil War.[1] When this war broke out, the Nestor of American surgery, the late Professor S. D. Gross, seized by the occasion, wrote a little work to be used as a guide by our surgeons.[2] The rules laid down in this manual represent largely the work done by our surgeons on the Federal side.

In the treatment of gunshot wounds, the

[illegible]

greatest stress is laid on the management of shock by the administration of stimulants, careful arrest of hemorrhage, and the prompt removal of all foreign substances from the wound, even the smallest blood clots. This was the typical treatment of recent gunshot wounds. Primary amputation was in favor, as experience in the Crimea had shown that the success of amputation was very fair when performed early, but most unfortunate when it was delayed any length of time. Flap and circular operations are recommended, and the former is given the preference in cases in which time is an important element. The flaps were sutured and supported by strips of adhesive plaster, and the stump placed on a pillow and covered with a water dressing. Bleeding was arrested by tying with waxed silk, the ends of the ligatures cut short, the long ones brought out and fastened on the surface of the flap.

"The best local applications are the water dressings, either tepid, cool, or cold, according to the temperament of the patient, the tolerance of the parts, and the season of the year." "The best plan, almost always, is to leave the opening or openings, made by the ball, free, to favor drainage and prevent pain and tension."

In speaking of hospital gangrene it is stated: "The proper remedies are sequestration of the patients, the free use of the nitric-acid lotion, iodine to the inflamed skin, charcoal, port wine, or yeast cataplasms, and frequent ablutions with disinfecting fluids, aided by opium, quinine, tincture of iron, lemon juice, and other supporting means. Mopping the affected surface freely with strong nitric acid often answers an excellent purpose. The favorite remedy of Poteau was the actual cautery." It is very strange that this terrible disease, this scourge of the military hospitals and of the larger European civil hospitals, which raged to such a fearful extent from the beginning of the eighteenth century until antiseptic and aseptic surgery came into general use, has disappeared from the face of the earth, never to return.

LANCE, SABRE, AND BAYONET WOUNDS

Among civilized nations, the lance has almost entirely disappeared as an implement of warfare. On the whole, lance wounds are not dangerous, as the majority of those injured with this weapon have recovered, even under the ancient unskillful treatment. In speaking of saber wounds, Dionis emphasizes the necessity of inspecting the weapon with which the injury was inflicted in case a part of the blade has been broken off in thrust wounds, in order to ascertain definitely the size and shape of the point lodged in the body. In the extraction of such a foreign body, he places much importance on withdrawing it in a straight line, in order not to inflict injuries on adjacent important vessels and nerves. Guthrie regards lance wounds as being less dangerous than bayonet wounds, as the latter are smaller, and consequently the escape of wound secretions more difficult. Saber wounds are clean cut, incised, or stab wounds, and unless important organs have been injured, or large blood-vessels severed, heal under the simplest non-meddlesome treatment. Much has been said recently concerning the utility of the bayonet as an arm. Some military authorities have been inclined to doubt its value as a weapon of war.

Guthrie[1] entertains a poor opinion of the bayonet as a weapon, as may be seen on page 15: "Opposing regiments, when formed in line, and charging with fixed bayonets, never meet and struggle hand to hand and foot to foot, and this for the very best possible reason, that one side turns round and runs away as soon as the other comes close enough to do mischief, doubtless thinking that discretion is the better part of valor. Small parties of men may have personal conflicts after an affair has been decided, or in the subsequent scuffle, if they cannot get out of the way fast enough. The battle of Maida is usually referred to as a remarkable instance of a bayonet fight; nevertheless, the sufferers, whether killed or wounded, French or English, suffered from bullets, not bayonets." "The siege of Sebastopol has furnished many opportunities for partial hand-to-hand bayonet contests, in which many have been killed and wounded on all sides; but I do not learn that, in any engagements which have taken place, regiments advanced against each other in line and really crossed bayonets as a body; although the individual bravery of

[1] Commentaries on Surgery, 1855.

smaller parties was frequently manifested there, as well as in the war in the Peninsula."

It is very natural to assume that the long-range firearms and the present strategy of warfare will reduce the employment of the bayonet as a weapon to a minimum; but the vicious bayonet charges of the Japanese soldiers during the late war with Russia have demonstrated that, under certain conditions, the bayonet has to be relied upon as a final weapon in storming a stronghold.

ARTILLERY WOUNDS

Artillery wounds are the same now as when the giant firearms first were employed in war. Cannon-balls, grape-shot, canister, and fragments of shells inflict torn, lacerated, and contused wounds, wounds notorious for their great receptivity to infection. The large, open, gaping wound, with a wide zone of tissue devitalized by the severity of the vulnerating missile, is only too often infected by the entrance of foreign matter from the very start, and the parts on the surface of the wound present the most favorable conditions for the growth of pathogenic micro-organisms. Some of the ancient cannons fired missiles of wood, stone, or metal of prodigious size. Ballingwall[1] relates that when Mahomet the Second besieged Constantinople, in the year 1453, he battered the walls with stone balls, and his pieces were some of them of the caliber of 1,200 pounds; but then they could not be fired more than four times a day. Other shot are mentioned as of 800 pounds weight, and one gun, stationed at the entrance of the Dardanelles, is said to carry a shot of 1,100 pounds. Stone shot of 150 pounds weight were thrown by Tippoo's army at the siege of Mangalore in 1783. If a cannon-ball strikes any part of the head, chest, or trunk, instant death is the usual result. Tangent shots, without any apparent injury of the skin, produce frightful subcutaneous injuries, which were formerly wrongly attributed to "windage," that is, violence caused by the air set in violent commotion by a cannon-ball passing near the injured person. As the result of his own extensive observations, Baron Larrey became convinced that soldiers were sometimes killed instantaneously by what was known as "windage" of balls, there being no external wound, but as in such instances post-mortem examination always revealed grave internal injury, he believed there must have been a blow by the projectile, in spite of the absence of surface lesions, an opinion which is now held by all military surgeons. This observation of Baron Larrey was not a new one, for it is stated by Johnson that "when another Dutch war broke out in 1672, Sheffield went again, a volunteer, in the ship which the celebrated Lord Ossory commanded, and then made, as he relates, two curious remarks: 'I have observed two things which I dare affirm, though not generally believed. One was, that the wind of a cannon bullet, though flying, is incapable of doing the least harm; and, indeed, were it otherwise, no man above deck would escape.'" (Ballingwall). Baron Larrey furnished the post-mortem proof of the correctness of this observation. If a cannon-ball strikes a limb, it may sever it completely, or leave it dangling by shreds of skin, tendons, and aponeurosis. It was in such cases that the ancient military surgeons did not hesitate to complete the amputation, by severing the limb and sawing off the projecting end of the bone or bones on a level with what appeared to them healthy tissue.

It becomes clear that the early dawn of modern military surgery is remarkable for both what was done and what was not done. The positive part of the progress was the substitution of the ligature for the actual cautery, burning cotton and filthy hemostasis, primary amputation in all grave gunshot injuries, the gradual abandonment of meddlesome surgery in the way of frequent dressing of wounds, and the too often resort to the finger and probe in searching for bullets. The negative part consisted in keeping wounds free from obnoxious, harmful lotions, salves, plasters, and replacing them by harmless light water dressings. Superstition gave way to reason, under the teachings and leadership of such masters as I have mentioned; and in doing so, prepared the soil for the reception and germination of the seeds of modern military practice.

[1] Outlines of Military Surgery, 1852, 4th ed.

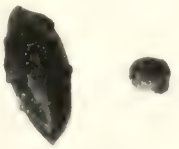
URETERAL CALCULI[1]

With a Further Report on the Combined Intra- and Extra-Peritoneal Uretero-Lithotomy

By JOHN H. GIBBON, M. D., Philadelphia, Pennsylvania.

As my prime object in choosing ureteral calculi for the subject of my paper is that of urging the advantages, especially in doubtful and difficult cases, of the combined intra- and extra-peritoneal operation, and as the demonstration of these advantages rests upon the experience had in six recent cases, probably my object would be better served and the subject better opened for discussion by a rehearsal of the histories of the different patients. Two of these cases have been previously reported in *The Annals of Surgery*, May, 1906.

Case 1. An Italian, 39 years of age, male, admitted to the Pennsylvania Hospital on August 3, 1905. The patient spoke English very badly but was sent in by his physician as a case of subsiding appendicitis. He gave a history of repeated attacks of pain in the abdomen, accompanied by vomiting and diarrhœa. The attacks lasted for three or four days, when he was able to get up and go about. Until the present attack he had been well for a year. This attack had lasted for three or four days and was accompanied by vomiting. Excepting for some slight tenderness in the right iliac fossa the patient at the time of his admission was free of symptoms. There was no tenderness over the kidney and he complained of no urinary symptoms; there continued a persistent tenderness on deep pressure in the right iliac fossa. He improved so much in a few days and the tenderness was so slight that my first inclination was to allow him to go out and return later if he had another attack. In other words, I was not prepared to accept the diagnosis of appendicitis. In view of the history, however, I concluded to operate. The patient's urine showed a number of red-blood corpuscles. Under chloride of ethyl-ether anæsthesia I operated on the 8th of August. The abdomen was opened through the right rectus; and when searching for the appendix my finger came in contact with a hard mass just below the iliac vessels in the true pelvis. It seemed about the size of a hazelnut, was very hard, and at first immovable. Although shaped like a gland, it was hard and there were no other glands enlarged. As it was in the line of the ureter I concluded it was probably a ureteral stone. I left it for further investigation and proceeded to examine the appendix. This organ showed evidences of an old inflammation, the vessels over it being very tortuous and there being numerous adhesions all about it excepting at the extremity. These adhesions bled quite freely when divided. The appendix stump was crushed with forceps and inverted by a purse string suture of gut. In order to make a more thorough examination of the small mass in the pelvis, I enlarged my incision downwards through the rectus. I was then able to determine that the mass was a stone in the ureter, and decided to remove it extra-peritoneally without, however, making another incision through the abdominal wall. The original incision was increased downwards and the peritoneum stripped from the abdominal and pelvic wall down to the ureter. With one finger in the pelvic



Case 1. Case 2.

Case 1. Male, aged 39. Pennsylvania Hospital August 8, 05. Intra- and extra-peritoneal uretero-lithotomy and appendectomy.

Case 2. Female, aged 32, Pennsylvania Hospital August 31, 05. Intra- and extra-peritoneal uretero-lithotomy and appendectomy.

cavity I was able to push the ureter and stone up into the extra-peritoneal wound within easy reach, but not within sight. I then opened the ureter longitudinally and removed a long, black stone, about the size of the end of the little finger and cucumber-shaped. In order to remove the stone quite a large opening was made in the ureter. A gauze drain was then passed down to the opening in the ureter and the peritoneal cavity was tightly closed with a continuous gut suture. The upper portion of the wound in the rectus was closed with sutures through its fascia. The superficial tissues were closed excepting at the lower end of the wound, where the gauze drain made its exit. In spite of the flow of urine through the gauze, which was quite profuse for about two weeks, the abdominal wound healed without any infection. On the 2nd of September very little urine was discharged from the fistula, and on the 6th of September the fistula was closed. It opened later, however, for a short time, but closed again, and has remained closed. The patient since his operation has worked as a laborer and has had no further attacks of pain.

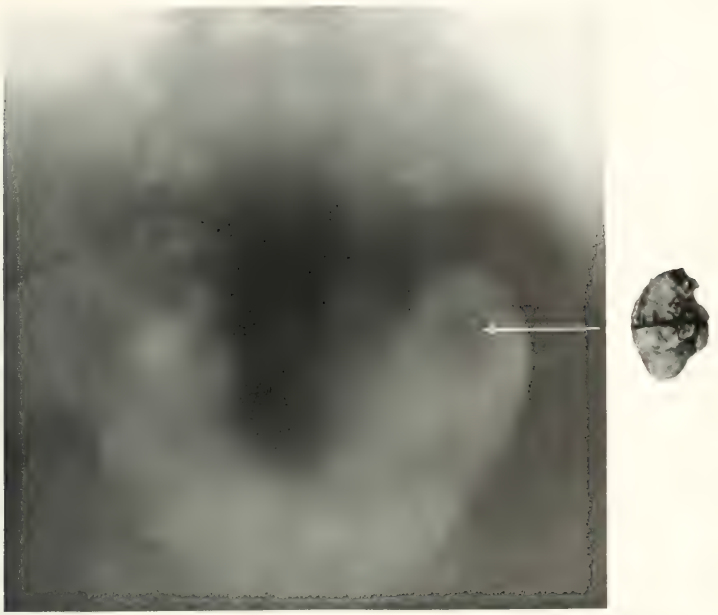
Case 2. A domestic, aged 32, was admitted to the Pennsylvania Hospital, August 12, 1905. This patient was sent into the hospital at night as a case of appen-

[1] Read by invitation before the Suffolk District Medical Society and the Boston Medical Library, February 5, 1908

dicitis and was seen in my absence by Dr. Francis T. Stewart. Dr. Stewart did not think the case one of appendicitis or one demanding immediate operation. I saw the patient the next day and could not make up my mind that there was any inflammation of the appendix. She gave a history of repeated attacks of pain in the right side of the abdomen in the appendiceal region, accompanied by vomiting. The pain was more or less fixed, there being no radiation to the back or to the bladder and there were no urinary symptoms. The examination of the urine, however, on the day after admission showed a few red-blood corpuscles and a trace of albumin. Repeated examinations of the urine continued to show red blood corpuscles. Examination of the abdomen on the day after admission showed considerable tenderness over the right kidney. This, however, disappeared and the only tenderness remaining was in the iliac region. A few days later, the patient passed both blood and mucus by the bowel; and the cæcum and sigmoid were quite tender. These symptoms did not persist, as did the microscopic blood in the urine. A differential diagnosis between appendicitis, colitis, renal calculus and ureteral calculus had to be made. With the disappearance of the renal tenderness and of the blood and mucus in the bowel movements, and in view of the absence of the characteristic symptoms of appendicitis, I made a diagnosis of a probable ureteral calculus on August 30th, and advised operation. The diagnosis was based on the continued tenderness in the iliac region, the repeated attacks of pain, accompanied by slight rise of temperature, and especially the persistent microscopic blood in the urine. Urinary symptoms were absent in this case, as in the previous one; there was no frequency of micturition, and no pain in the bladder. The right kidney was not movable. The menses had been irregular and painful. I determined to follow the same technique as in the previous case, especially as I was in doubt regarding the diagnosis. Therefore, on the 31st of August, under ethyl chloride-ether anæsthesia, the abdomen was opened through the outer edge of the right rectus, low down, the appendix was readily found and removed as in the previous case; it was perfectly normal. The ureter, which was thickened, was easily felt crossing the iliac vessels. About one inch below the vessels a hard, small, immovable mass was felt. The peritoneum was stripped away from the abdominal and pelvic walls after increasing the incision downwards. The ureter was exposed and brought plainly into view. Great assistance was also derived in this case from a finger within the pelvis pushing the ureter up into the extra-peritoneal wound. The ureter was incised longitudinally and a small irregular stone, very rough and adherent to the ureteral mucous membrane, was removed. A gauze drain was inserted down to the ureteral wound, the peritoneal cavity was closed, and all but the lower portion of the wound in the abdominal wall. Although in this case a smaller incision in the ureter was required than in the previous one, there was a greater and more prolonged leakage of urine. The wound healed promptly excepting at the point of drainage, and the patient never had an abdominal symptom. On September 30th, one month after the operation, there was no flow of urine, but there was some discharge from the drainage tract which remained open for about two weeks. The patient was discharged on November 29th, the wound having remained closed for about a week. The patient was heard from recently and has remained perfectly well since her operation.

Case 3. Single woman, aged 50, admitted to the Pennsylvania Hospital September 19, 1906. For some months she had noticed a gradual enlargement of the abdomen, but supposed it only an accompaniment of advancing years. During the previous two weeks there had taken place considerable swelling of both lower extremities. This was quite marked on admission, and there was a distension of the superficial abdominal veins and those of the buttocks and thighs. There was a large fluctuating tumor in the right side of the abdomen extending from the pelvis up to the border of the ribs. It seemed most prominent in the right iliac region. The rest of the abdomen was soft and pendulous. Rectal examination revealed nothing definite at this time, and vaginal examination could not be made because of a tight hymen. There was present a mass of inflamed hemorrhoids. The patient had no fever or other indication of an inflammatory condition. She had had no urinary symptoms. By those who admitted her it was thought she probably had an ovarian cyst, and it was only when I examined her on the operating table that I concluded that the tumor was a distended kidney: because of the swollen extremities and distended veins I thought it likely that the growth might be malignant. The patient was very much emaciated and her condition was not particularly promising for an extended operative procedure. The tumor was so large that I concluded to approach it through the peritoneal cavity. It was found to be an enormously distended kidney with a dilated ureter. The peritoneum over the tumor was divided and the kidney removed after being emptied with a trocar. Six and a half quarts of dark brown fluid were withdrawn. This was the most marked hydronephrosis I have ever seen. Upon withdrawing the collapsed sac there was no difficulty in isolating all the structures at the hilum and ligating them separately. The vena cava was exposed for about six inches. I removed with the kidney about 6 inches of ureter. I was so well pleased at getting the kidney out without more difficulty, and I was so impressed with the patient's poor condition at the time of operation, that I foolishly did not explore the remaining ureter. The edges of the posterior peritoneum were united to the edges of the anterior peritoneum and the wound closed excepting for a gauze drain. The colon had been pushed to the median line by the growth, so that it did not incommode us in any way during the operation.

The patient made a very satisfactory recovery from the operation excepting that she had at times irritability of the bladder and for a while had difficulty in passing urine. The irritability of the bladder continuing, the patient was anæsthetized with chloride of ethyl and both a careful vaginal and rectal examination



Case 3. Female, aged 32. Pennsylvania Hospital, October 26, 1906. Extraperitoneal incision [illegible]

made. I then detected a hard mass at the lower end of the right ureter. I had already sounded the bladder for stone but could find none. A skiagraph was made by Dr. W. E. Lee, which showed the stone within a short distance of the bladder.

Six days after the previous operation she was again anæsthetized and the ureter exposed through an extraperitoneal incision made just above Poupart's ligament. Passing down through the floor of the inguinal canal the peritoneum was pushed away until the stone could be easily felt. It lay within a very short distance, probably an inch or half an inch, of the bladder. The removal was greatly facilitated by an assistant, who passed a finger into the rectum and pushed the stone up. The ureter was opened and there was an escape of considerable pus. The stone is shown in the accompanying illustrations. The ureter was quite friable and easily torn. I passed my finger down to the vesical orifice and up to the point where it was ligated in the the previous operation, but no other stone was felt, although the one removed showed a distinct facet on one end. The X-ray plate had revealed but one stone. There was considerable bleeding when the ureter was first exposed, apparently venous in character. It was controlled by pressure, however, and when the operation was completed there was no bleeding. A gauze drain was inserted and the wound partially closed. The patient made a most satisfactory convalescence but there was a considerable discharge of pus from the wound for some time. Since leaving the hospital she has been perfectly well and her weight has increased from 104 to 147 pounds.

Case 4. Married woman, aged 32, operated on at the Bryn Mawr Hospital, June 11, 1907. I saw this patient first with Dr. Thomas F. Branson, of Rosemont, Pa., on May 23, 1907. She had had her first attack of severe abdominal pain about three years previous. It lasted a very short time and was not severe. The pain was rather general, though more marked on the right side. A diagnosis of appendicitis was made. She was operated upon by another surgeon two months later; the appendix, which apparently was perfectly normal, at this time was removed. She had no more pain for a year. Since then, however, she had had repeated attacks of typical renal colic, the pain being largely in the back and in the left loin. Dr. Branson had only had charge of the patient for three or four months, and during this time she had had several attacks. The pain radiated down the ureter in each of these, and there was always considerable tenderness

Case 4. Female, aged 32. Bryn Mawr Hospital, June 11, 1907. Intra- and extra-peritoneal ureterolithotomy.

over the ureter after the attacks. Several X-ray plates had been made previously of the kidney and upper portion of the ureter, but all of them were negative. Catheterization of the ureters had also been done without detection of the stone. In one attack the patient passed considerable blood during its subsidence, but during the recent attacks there had been only microscopic blood. An X-ray plate made by Dr. Willis F. Manges, showed a distinct shadow about the size of a pea, in the line of the left ureter just below the brim of the true pelvis. Examination of the patient showed the right kidney to be quite movable. Neither kidney was tender. There was, however, considerable tenderness over the left ureter. The X-ray plate indicated that the left kidney was larger than the right, and lower down than it should be, but I could not demonstrate this clinically. The patient stated that in her attacks she had passed large quantities of urine, so that this enlargement might have been due to a blockage of the ureter. I did not operate upon this patient until June 11th. On the day previous to operation another X-ray plate was made which showed the shadow in exactly the same position. A small, round shadow was shown in this second plate, just below the other, which had not shown in the previous plate. Dr. Manges thought that it was probably a phlebolith.

The patient was anæsthetized with the chloride of ethyl-ether-morphia sequence. An incision was made about one and a half inches internal to the anterior superior spine and parallel with Poupart's ligament, and the muscles divided in the direction of their fibres. The peritoneum was separated from the pelvic wall up as far as the bifurcation of the common iliac. There was considerable bulging of the sigmoid into the wound, and I had difficulty in detecting the ureter. A small incision, sufficient to admit one finger, was then made in the upper part of the exposed peritoneum, and through this opening I readily detected the calculus about one and a half inches below the iliac vessels. Before discovering the calculus, a round body below the ureter, which felt too soft for a calculus, was discovered, and determined afterwards to be a gland; I think it was this which cast the shadow in the second plate. The calculus was pushed up into the exposed portion of the ureter, and was very easily brought into view. Supporting the ureter with the forefinger in the peritoneal cavity and the thumb in the external wound, it was incised longitudinally and the stone

Case 5. Male, aged 12. Jefferson Hospital, October 12, 1907. Intra- and extra-peritoneal uretero-litholomy.

removed. It was oblong and resembled a split pea: one end was quite rough with projections. No other calculi could be felt in the ureter, although it was explored thoroughly. The peritoneal wound was then closed and the ureteral wound closed with several sutures of chromic gut. A small gauze drain was introduced down to the site of the sutured ureter, and the wound closed. The drain came out in the middle of the incision, and a subcuticular stitch was introduced on either side of it.

In this case there was a very satisfactory exposure of the ureter, and no difficulty at all in removing the stone and closing the wound. The gauze drain was removed on the fifth day. The wound healed promptly, and there was never any infection or leakage of urine.

This patient has been free of all attacks of pain since the operation. She has put on weight, and excepting for occasional backache, which she had had long before her renal attacks, and for which a suspension of the uterus had been done, she is perfectly well.

Case 5. Boy, aged 12. Operated upon at the Jefferson College Hospital, October 12, 1907. I saw this boy about six months before his operation with Dr. E. E. Graham; at that time he gave a typical history of attacks of renal colic with blood and pus in the urine; the attacks, however, were never very severe. Several X-ray plates were taken at different times by Dr. W. F. Manges, and always showed a fairly good sized stone lodged between the pelvic brim and the bladder. At that time, I recommended operation but it was declined. Dr. Graham kept in touch with the case, however, and as the symptoms continued the patient was again admitted to the hospital. He had continued to have blood and pus in the urine. A recent X-ray plate showed the stone a little lower down, apparently, than in the previous plates. It was stated that the boy had also passed blood and mucus by the rectum, for which he had recently applied to the Rectal Department. Whether there was any association between this condition and the ureteral calculus it is difficult to say, but it was interesting to note that in my second case this same symptom was present. As the stone was quite large, I felt I might be able to locate it easily without opening the peritoneum. An incision was made just above Poupart's ligament, the muscles separated, the peritoneum pushed away along the iliac vessels, and an attempt made to locate the stone. This failed and a buttonhole in the peritoneum at the lower angle of the wound near the inner edge was made. The forefinger was introduced and the stone at once located about an inch and a half or two inches below the iliac vessels. The peritoneum was further separated from the pelvic

Case 6. Male, aged 10. Pennsylvania Hospital, January 15, 1908. *a*) Intra- and extra-peritoneal uretero-litholomy. *b*) Extra-peritoneal uretero-litholomy.

wall down to the point of the stone, and with the forefinger in the peritoneum and the thumb outside an attempt was made to force the stone up the ureter so that it could be brought to the surface and the ureter opened at a healthy point and in clear view, but this we were unable to do. There was considerable thickening and old inflammatory adhesions about the ureter. Rather than separate it from its surroundings I concluded it would be wiser to incise the overlying ureter without seeing it. This I did by fixing the stone with the forefinger and thumb, as in the previous cases, and carrying down a pair of curved scissors over the iliac vessels. The opening was made in the long axis of the ureter and just long enough to permit the extraction of the stone with forceps. The stone was rough and very adherent to the mucous membrane. It was nearly round and measured half an inch in diameter. There was little or no bleeding following the extraction. No sutures were introduced into the ureter, but a gauze drain was carried down to the site of the wound. The forefinger was then withdrawn from the peritoneum, and the wound in this structure closed with catgut. The muscular and skin wounds were partially closed. The patient passed considerable bloody urine for several days, but there was never any leak from the ureter. About ten days or two weeks after the operation, when the boy was up and about, he had some pain with a rise of temperature, and passed several pieces of gravel about the size of the lead of a pencil. Since this time he has been perfectly well. His external wound measures 1¾ inches in length.

Case 6. Boy, aged 10 years, operated upon at the Pennsylvania Hospital, January 15, 1908. This boy first began to have attacks of pain in the right side of the abdomen, with bloody urine and frequent micturition about two years ago. Since this time he had had numerous attacks of sharp pain lasting for several days, accompanied by the passage of considerable bloody urine. He came into the hospital during the subsidence of one of these attacks, which had lasted for several days. At the time of admission there was marked tenderness along the course of the right ureter and over the bladder. There was very little tenderness over the right kidney and none on the left side of the abdomen. The bladder was sounded for stone but none found. Two X-rays plates were made by Dr. A. E. Billings, with an interval of several days, and each showed stones; on the right side there were two stones, one smaller than the other, and the two very close together in the line of the ureter. On the left side was a small oblong stone. One plate showed a small shadow some distance from the stone in the region of the left ureter, but not in the line of the ureter, but as the other plate did not show this shadow I was not inclined to believe it was a stone. The stone on the left side was lower down than the two on the right. By rectal examination the stones on the right side could be just felt with the tip of the finger, and no stone could be felt in the left ureter, although the stone on this side was lower down. By confusing the two sides of the X-ray plates, we thought the large stones were on the left and the smaller stones on the right

side, but the operation convinced us of this error. The right ureter was exposed extra-peritoneally by the muscle-splitting incision parallel to Poupart's ligament and just above the inguinal canal. The peritoneum was pushed away from the pelvic wall until the ureter was reached, but it was impossible without considerable rough handling to get the ureter and the stones up to a point where they were readily accessible. The stones seemed fixed at a point about 1½ inches below the iliac vessels. A small buttonhole incision was then made in the peritoneum, near the upper border of the wound, and a forefinger inserted. The stones were readily found. I then tried to locate the stone in the opposite ureter through this incision, but could not do so without increasing my wound to an extent which I did not wish to do, as it was my intention any way to explore the other ureter. Returning to the right ureter, I was able with my forefinger inside the peritoneum and my thumb in the extra-peritoneal wound, to free the ureter and get it up into view. The stones were held with the forefinger and thumb and a longitudinal incision made through the ureter and the stones removed. No sutures were inserted but a small Penrose drain was carried down to the ureter. The peritoneal wound was then closed and the muscular structures partly closed. A corresponding incision was made on the opposite side and the peritoneum separated in exactly the same way. I had no difficulty in feeling the stone lodged about 2 or 2½ inches below the iliac vessels. The stone was quite freely movable in the ureter; and I was able to pass it up to a point about one inch above the iliac vessels and bring the ureter well into view; without opening the peritoneal cavity. The ureter was incised, the stone removed, and two gut sutures inserted. A Penrose drain was introduced and the wound partially closed. The entire time occupied in this operation, including both sides, was thirty minutes. The patient made an excellent recovery, the drains were removed on the third or fourth day, there was never any leakage of urine, and in two weeks the patient was up and moving about the wards, with the wounds entirely healed. For the first 24 hours he passed some bloody urine but not as much as during his last attack. The wound on the right side measures 3 inches, and that on the left side, 2 inches in length.

A brief survey of these six cases shows that in the last four an absolute diagnosis was made on the clinical symptoms and X-ray presentations. In the second case, ureteral calculus was suspected, and in the first case it was not suspected but found in operating for appendicitis. In two cases the stone was felt through the rectum or vagina. The ureter was sutured in 2 cases (4 and 6). In the last four cases there was no urinary leakage whatever. The combined intra- and extra-peritoneal uretero-lithotomy was done five times and the extra-peritoneal uretero-lithotomy was done twice. All the patients recovered.

PATHOLOGY

The occurrence of stone in the ureter is a much more common condition than was ever thought until the X-rays revealed its frequency. Leonard (1) and other radiologists state that ureteral stones are probably more frequent than renal stones. This statement, of course, has hardly been borne out in our operative experience: it nevertheless deserves serious consideration, and we believe that further experience will tend to corroborate it.

Ureteral stones may be either primary or secondary. Primary stones must of course be very rare, and can occur only when there is some localized point of irritation or ulceration of the ureter, or where a foreign body is present. A silk suture, for instance, may be the nucleus of a primary ureteral stone. This occurred in a case operated upon by Kelly at the Johns Hopkins Hospital, and included in a report of cases by Schenck (2). The secondary stones are the common ones, and make their way from the kidney. These stones pass into the ureter when they are small and may become lodged and greatly increase in size.

Location. There are three locations in the ureter where a stone is apt to become lodged. The first is at a point about an inch and a half below the pelvis of the kidney; the second, is in the bend of the ureter about an inch to two inches below the pelvic brim; and the third is the vesical portion. Many authorities, including Morris (3), state that a common point of lodgment is where the ureter crosses the brim of the pelvis. A careful examination of the reported cases, however, and my own experience, tend to show that most of the stones are lodged below the iliac vessels and therefore, below, and not at, the pelvic brim. Schenck, in one of the first exhaustive papers on this subject, reports a collection of 101 operations for ureteral calculus. The situation was noted in 98. In 20 the calculus was within 6 cm. of the kidney; in 14 at or near the pelvic brim; in 55 within 6 cm. of the vesical orifice; in the remaining cases the stones were distributed at other points in the ureter. Morris reports 44 cases in which the location was stated. In 19 the stone was lodged within 2 inches of the kidney; in 13 "just before or where the ureter passes through the

Case operated upon at the Pennsylvania Hospital, October 10, 1906. Shadow shown is that of a cyst in the broad igament containing material of the consistence of putty.

vesical wall"; and in 11 somewhere about the line of the brim of the true pelvis; in 3 of these 11 the stone was below the brim, in 2 on the brim, and in 5 just above the brim. Tenney (4) has made a collection of 134 cases; adding 33 to those of Schenck. Morris states that impaction at the vesical orifice is apparently more common in males than in females. The earlier operations were done for stones lodged near the kidney, and at the vesical orifice; and consequently the impression arose that these were the most frequent sites of lodgment. Recent X-ray reports, however, tend rather to show that the portion of the ureter between the pelvic brim and the vesical portion, measuring about 4 inches, is a very common site for ureteral calculi. Morris attributes lodgment at this point to the curve made by the ureter. The lodgment of a stone in the ureter may be due to the narrowing or constriction of the ureter or to the size, shape and degree of roughness of the stone. Of course, as said before, an ulcer of the ureter, or a foreign body, such as a suture penetrating its calibre, may determine the site of development of a primary stone.

Size and Shape. Apparently ureteral calculi may be of any size or any shape. My own few cases show a great variety in both. Bovee (5) reports a case in which he removed by the transperitoneal route, a stone weighing 1310 grains and measuring $2\frac{3}{4}$ x $1\frac{1}{2}$ x $1\frac{1}{4}$ inches. The ureter was sutured and vaginal drainage established. There was no leakage. The majority of stones are of an oblong shape, especially those which are primary or which remain and increase in size after lodgment in the ureter. In my fifth case, however, the stone was quite large, and nearly round, and must have been in the ureter for a long time. Israel and Morris each report cases of stones measuring 5 or 6 inches in length.

Number. In the majority of cases operated upon but one stone has been found in the ureter; but on the other hand, the ureter has been found packed with stones for nearly its entire length, and the term "chain-stones"

Case operated upon at the Pennsylvania Hospital, November 12, 1906. Shadow shown is an appendiceal concretion.

has been applied to this condition. Doyen, quoted by Schenck, removed 24 stones from the ureter by the vaginal route; Morris has removed as many as 9 stones from the ureter; Young (6) removed 3 large calculi from the lower end of the ureter by the extra-peritoneal iliac route; and Kelly (7) removed 2 stones from one ureter by the transperitoneal route. In one of my own cases (Case 6), two stones were removed from one ureter and one stone from the other. Fiori, quoted by Deaver (8), removed 10 or 12 stones, making an incision in the ureter 16 cm. long, for the purpose. The incision was closed and the urinary leak which followed ceased in a few days, and the patient recovered.

Passage. Larger stones pass through the ureter than one would suppose. The smaller ones may do little damage to the ureter in their passage, but the larger ones often produce ulceration, especially in the vesical portion of the ureter. Leonard is a strong advocate of the non-operative treatment of many of the small stones which apparently are lodged in the ureter, his opinion being based on the idea that these stones will pass. Of the dangers of leaving a stone impacted in the ureter something will be said later.

Results of Impaction. Many reported cases go to show that a stone may remain impacted in the ureter for a number of years, and apparently create but a small amount of discomfort. The size and shape of the stone in my first case, and the fact that the patient had been able to carry on his work as a laborer with but little discomfort, tend to illustrate this statement. It will be observed, however, in this case that the stone was smooth. As a result of the impaction the ureter may become ulcerated and thickened. It may be perforated by the stone, as in Keen's case (9), and cause an abscess around the ureter, or it may perforate into the rectum or bladder. In Keen's case the stone was lodged just below the pelvic

brim and was definitely located by the X-rays. It was removed by the extra-peritoneal route, the patient making a good recovery. The ureter above the stone in most instances is dilated, the degree of dilatation of course depending upon the degree of obstruction. In my third case the ureter was as large as a thumb. Even if a stone should pass on into the bladder, it may produce sufficient ulceration of the mucous membrane to cause a stricture of the ureter. A stone lodged in the ureter tends to increase in size, and its rapidity of growth will probably depend upon the degree it interferes with the passage of urine. It is quite probable also that the lodgment of a stone in the ureter tends toward the production of other stones behind it in the ureter or kidney. A rough stone, if unattached, will interfere less with the passage of urine than a smooth one, but many of these rough stones become firmly embedded in the mucous membrane and completely obstruct the ureter.

Probably the most serious changes resulting from the impaction of ureteral calculi occur in the kidney. A *complete* obstruction of the ureter by a stone causes an atrophy of the kidney with complete loss of function. An *incomplete* obstruction of the ureter produces a hydronephrosis. Although a hydronephrosis is the first result of an incompletely obstructed ureter, it is very apt to be converted into a pyonephrosis, especially if there are a number of stones present. A complete anuria may result from the lodgment of a ureteral calculus, and this calls for the promptest treatment.

Deaver reports a case in which a carcinomatous change had taken place in the ureter at the point of lodgment of the calculus. I have been able to find no other similar case, but it goes to show one of the possible results of allowing a stone to remain impacted for any great length of time.

SYMPTOMS AND DIAGNOSIS

The symptoms of ureteral calculus may be typical and quite sufficient for diagnostic purposes, but this is by no means the rule, for they are often confusing, and although indicating stone somewhere in the urinary tract, do not indicate even approximately its location. It may be said that, aside from the use of the X-rays and possibly the ureteral catheter, it is impossible to differentiate between stone in the ureter and in the kidney. Stones in the lower portion of the ureter and especially in the vesical portion, may be so confused with stones in the bladder that a diagnosis can be arrived at only by the use of the sound, the cystoscope and the X-rays. Stones lodged within two inches of the bladder may be palpated through the vagina or rectum. Unless a stone can be palpated, detected with a ureteral catheter, seen with the cystoscope, or definitely shown in an X-ray plate, operation is hardly warranted unless clinical signs are persistent and then operator should expect to find some other lesion than calculus. It is certainly not warranted until all the means mentioned, and especially the X-rays, have been employed.

Pain and Tenderness. Pain, the result of ureteral calculus, is nearly always of a paroxysmal character. In most cases operated upon, there is a history of repeated attacks of colic. Occasionally, as in Case 3 of this series, the patient will be unable to recall an attack of colic, and yet the ureter may be completely obstructed and the kidney destroyed. The pain so closely resembles that of renal colic when the stone is in the upper portion of the ureter that it is nearly impossible to differentiate between the two; and when it is in the vesical portion or near to the bladder the pain and other symptoms may so closely resemble those of vesical calculus as to make differentiation impossible without the use of the X-ray, the sound, or the cystoscope. It is probably true that in nearly every case of renal colic there is a partial or complete passage of a stone into the ureter. When the stone has lodged in the lower portion of the ureter, the pain is very apt to be referred to the bladder and the testicle, and occasionally to the glans penis. Frequent micturition and tenesmus are common accompaniments in these cases. Parker (10) has reported a case of a large calculus, removed by suprapubic cystotomy in which all of the pain and tenderness were referred to the rectum. Localized tenderness is of far more value in the diagnosis of ureteral calculus than the character or site of the pain, but often this may be misleading, as for instance, in Case 4, where the tenderness was greatest over the bladder.

and was accompanied by marked vesical symptoms. Localized tenderness is much more indicative when found after the subsidence of the colic. The tenderness, due to stones lodged in the lower ureter, is apt to be much more localized and fixed and persistent than the tenderness due to an inflamed appendix. The difference in the tenderness, however, of the two conditions is not sufficiently great to enable one to make a differential diagnosis without the consideration of other symptoms. We are all familiar with the urinary symptoms that accompany many cases of appendicitis where the appendix lies against the ureter or where there is an inflammatory effusion into the pelvis. The tenderness also can be easily confused with that resulting from an inflamed ovary or tube. Vaginal examination and history are usually sufficient, however, to differentiate the two conditions. The size of the stone does not influence the pain so much as its shape and degree of roughness. For instance, in Case 1, where there was a large, nodular, but smooth stone, the pain was much less than in Case 4, where there was a small, rough stone. In conclusion it may be said regarding pain that where there is a renal colic associated with marked vesical symptoms, a calculus in the lower portion of the ureter should be strongly suspected. Backache is a rather common symptom of ureteral stone, but it cannot be differentiated from the backache due to renal calculus.

A vaginal or rectal examination should be made in every suspected case and where the stone is within two inches of the bladder it can as a rule be felt. Cases have been reported in which a stone could be felt by palpation through the abdominal parietes, but this was not true in any one of the cases here reported.

Hæmaturia. Hæmaturia when accompanied by other symptoms, and especially when persistent even to a slight degree after the subsidence of the attacks of pain, is of great significance. I think that the persistent microscopic blood in the urine for several days after an attack of colic is of more value than marked bleeding during an attack. In order to avoid error the urine examined should be passed voluntarily, as otherwise it cannot be said that the blood is not the result of some traumatism produced by catheterization. The blood obtained through a ureteral catheter, especially, cannot be relied upon as having been produced by a stone, since the catheter itself may easily produce bleeding.

Polyuria, Oliguria, and Anuria. Polyuria coming on with the subsidence of an attack of pain is of great significance, especially if it has been preceded by an oliguria during the pain: it would tend to show that the ureter had been blocked, urine had accumulated behind it, and that now the blockade had been lifted and that the dammed up urine was making its escape. Complete anuria has frequently resulted from blockage of a ureter by a stone, and when this condition accompanies and follows an attack of renal colic, calculus should be at once suspected and operation promptly instituted.

Urinalysis. Daily urinalyses are of great value and should be especially directed to the discovery of microscopic blood. Some authorities have stated that they can tell more or less definitely by examination of cells the point of the urinary tract which is diseased or injured. This, however, has not been placed upon such a basis as to be of real diagnostic value. The same may be said of cryoscopy. Pus is often present, especially where the stone is embedded in the ureteral wall or where it occupies the vesical portion of the ureter. None of the urinary findings compares in value to that of persistent microscopic blood.

Fever and Chills. In the majority of my own cases a rise of temperature has accompanied most of the attacks of colic, and occasionally a chill has preceded the rise. Serious infection of the ureter, however, is not indicated by the rise of temperature. Repeated chills should cause us to suspect serious ulceration or abscess formation.

Cystoscopy. The use of the cystoscope may throw much light on the diagnosis of ureteral calculi. The benefit to be derived from the use of this instrument, in cases where the stone is lodged in the vesical portion of the ureter is at once apparent. Numerous cases are on record where a stone has been seen projecting through the ureteral meatus and where its removal has been easily accomplished by means of the cystoscope. Young reports several such

cases. Even where the stone cannot be seen, much may be learned by a comparison of the ureteral openings and the character of the urine passing through them. In several of the earlier reported cases of ureteral calculus the bladder was opened and the calculus palpated in the ureter some distance from the vesical orifice.

Ureteral Catheterization and Exploration. Schenck states that in 6 cases at the Johns Hopkins Hospital the stone was demonstrated and definitely located by the wax-tipped catheter. Young also has located them with the ureteral catheter. Fowler (11), too, reports a case in which the stone was located with the catheter and subsequently confirmed by X-ray and operation. Personally, I have had no experience in this line. In two of the cases (4 and 5) of my series, ureteral catheterization had been done without giving rise to any definite information. The catheter, apparently, in both cases passed the stone. If the ureter be dilated behind the stone, the latter may be easily displaced by the catheter which will then pass. That ureteral catheterization is not without its dangers, even in healthy ureters, is shown by a case of Noble's (12). In this case, which was operated upon in 1901, a stone in the ureter was apparently indicated on an X-ray plate. Noble had, a few days before operation, catheterized both ureters without difficulty. He determined to reintroduce the ureteral catheters for the purpose of aiding in the location of the ureter during the operation. The catheter met with a slight obstruction and very little force was used to overcome it, when the catheter passed quite readily. An incision was then made for the extra-peritoneal exposure of the ureter in the iliac region. The peritoneum was accidentally opened, and the opening was then increased in size and a finger introduced for the purpose of palpating the ureter. The operator was suprised to find the ureteral catheter free in the pelvic cavity, having perforated the ureter just outside the bladder wall. The ureter was closed, no stone could be found, although careful search was made, and the patient recovered without leakage of urine. Noble reports another case of successful extra-peritoneal removal of a calculus from the lower ureter, in which the ureter was sutured and there was no leakage. Tilden Brown suggested the introduction of stilletted catheters into the ureters before X-ray plates were made, in order to determine the relative position between the ureter and any shadows which might be found. Kolister and Schmidt (13) recommend the passage of soft flexible wire probes, made of lead blended with antimony, for the same purpose. Either of these methods would, in our opinion, carry with them far more danger to the ureter than would be warranted by the results obtained. If a healthy ureter can be injured as easily as in Noble's case, how much more readily might an ulcerated ureter, or one blocked by a stone, be perforated. The passage of an instrument through any long, inflamed or ulcerated mucous tract is always a dangerous procedure. The ureteral catheter may be valuable in determining the performance of function of the kidneys and ureters, yet this information usually may be obtained by the simple use of the cystoscope. The wax-tipped catheters may also prove of service where the X-rays fail to reveal a stone, and yet the clinical signs point persistently to this condition. In this connection, it must be remembered that the X-rays in the hands of experienced men at the present time, practically never fail to show a stone, unless it is a pure uric acid or phosphatic stone, and even these are often shown.

Roentgen Rays. It is due nearly altogether to the X-rays that ureteral surgery has reached its present stage of usefulness. Leonard and others deserve high praise for the work they have done in this line. The question at once arises, can the X-ray plate be relied upon when it shows no stone? The answer to this question is yes, unless the stone is a pure uric acid or phosphatic one, and such stones we know are very rare. Leonard (14) claims to show even pure uric acid stones. In nearly every case of uric acid or phosphatic stone oxalate crystals are also present in sufficient degree to cast a shadow. Osgood (15), in an excellent paper on the Diagnosis of Obscure Cases of Renal and Ureteral Calculus, reports a case of large uric acid calculus in which no shadow was cast in a number of otherwise good X-ray plates. My own feeling is that the X-rays are much more apt to deceive us by showing

a shadow which is not due to a stone, than by showing no shadow when a stone is present. Brewer (16) has reported a case in which an appendolith cast a distinct shadow; and we have had a similar experience. A print of the plate in my own case is shown. The patient had an appendiceal abscess overlying the ureter, with marked vesical symptoms, including at first retention, followed by hæmaturia and great vesical pain. A mass developed and a diagnosis of appendiceal abscess was made. An X-ray plate was then made which showed a distinct shadow in the line of the ureter and the patient was operated upon for ureteral calculus with probable peri-ureteral abscess. When the abscess was opened through a muscle-splitting iliac incision, an appendolith was found free in an abscess cavity and a necrotic appendix formed a part of the abscess wall. The patient recovered and has been entirely free of all symptoms since his operation, which was done November 12, 1906. Radiologists tell us that appendoliths do not cast shadows, but there are certainly exceptions to the rule. The present concretion was placed under quite a muscular arm, and a distinct shadow was again shown in the plate. In another case, the X-ray prints of which are shown, and in which I strongly suspected a ureteral calculus because of the shadow shown in the line of the ureter and the associated urinary symptoms, I found on opening the abdominal cavity for exploratory purposes a small, tense cyst in the broad ligament filled with a putty-like material. The ureter was carefully examined but no stone found. Frequently small round bodies are shown on X-ray plates of the pelvic region which are irregularly placed; these are believed by radiologists to be phleboliths and when they occur in the line of the ureter, are extremely confusing. Calcareous deposits in muscles and vessels also cast confusing shadows. It is in such cases that ureteral catheterization with the wax-tipped catheter, or intra-peritoneal exploration may be indicated if the urinary symptoms are marked. In order to be of the greatest value, the X-ray plate should include both kidneys, both ureters and the bladder. Failure to carry out this rule has often resulted in serious accident. In one of Deaver's cases stones were removed from one ureter, and at postmortem it was found that the other ureter had been blocked by a stone which had not, before the operation, been suspected. In one of my own cases (Case 6) the stone in the left ureter was not suspected, nor were there symptoms pointing to it. In view of the experience had in this case, namely the confusing of the two sides of the plate, it is important to fix definitely the right or left side. I would suggest placing a penny, or some other metal object, on the right anterior superior spine of the ilium. This would render such confusion of the two sides as occurred in this last case impossible.

Stereoscopic radiographs are of additional value, and give one a fairly good idea of the relation of the stone to surrounding bony structures. In Case 4 Dr. Manges made such plates and the result was most satisfactory. Before an X-ray plate is made, a careful preparation of the patient is absolutely essential. The bowels should be thoroughly evacuated, preferably with castor oil and enemata. If this rule is not followed, confusion and errors are sure to result.

Although of probably the greatest value in diagnosticating ureteral calculi, the evidence of the X-rays alone is not sufficient. The other signs and symptoms must be considered with the X-ray plate. The interpretation of the plate itself also is frequently difficult, even in the hands of an expert. It is always well to take more than one plate, and especially to have a plate made within at least forty-eight hours of the time of operation. If this is not done, a fruitless and unnecessary search of the ureter may be made, for a stone which has passed into the bladder.

TREATMENT.

Every case of ureteral calculus does not require operation, but every stone that is too large to pass or that remains stationary for any length of time, or that is giving rise to severe attacks of colic that do not carry it farther down the ureter, and, above all, one that produces symptoms indicating blockage of the ureter with distension of the kidney or infection, as indicated by the urinalysis, should be removed irrespective of its situation. That fairly good sized stones do pass we all know.

Da Costa's case of ureteral calculus, passed just before admission to hospital for operation.

The accompanying skiagraph of a case under the care of my colleague, Dr. J. Chalmers Da Casta, shows a fairly good sized stone which passed just before the patient was admitted to the hospital for the purpose of having it removed. On arriving at the hospital, the patient said that a day or two previous he had had a sharp pain during micturition, that the urine stopped and then came with a rush, and that he heard something strike the urinal. Another X-ray plate was made, which is also exhibited, in which the calculus is not shown. The drinking of large quantities of water will greatly aid the passage of a ureteral stone, and this treatment has been urged by Leonard and others. It has been suggested by Schmidt that the injection of vaseline through a ureteral catheter would aid the passage of a stone situated in the lower portion of the ureter.

The operative treatment had best be considered as applicable to stones situated in the upper third, in the lower two-thirds, and in the vesical portion of the ureter, as entirely different operative procedures are required in the different localities.

Stones in the Upper Third. Stones in the upper third may be removed through a lumbar incision, such as is usually employed for the exposure of the kidney, or through the Israel incision, extending from the tip of the last rib obliquely downward, along the iliac crest. The operation should be performed retroperitoneally. When the stone is located, the question will arise as to whether it shall be

pushed up into the kidney pelvis and removed here, or through the kidney substance. Deaver has advised pushing the stone into the pelvis and removing it through the kidney cortex, and this was the advice of Israel, Tuffier, Newman (17), and others. More recent work, however, has shown that it is perfectly feasible to remove the stone through a longitudinal incision in the ureter, and this I should much prefer, even if the stone were movable. If, however, it is freely movable and can be easily passed back into the pelvis and the pelvis is quite accessible without an increase in the length of the incision, it may be removed through a pelvic incision. Clean wounds of the pelvis heal promptly whether sutured or not. We are inclined to believe that a wound in the ureter, whether sutured or not, will heal more quickly and with less likelihood of a urinary leak than one in the pelvis, and experience and recorded cases bear out this view. In the absence of a suspected renal lesion, incision through a healthy kidney for the purpose of removing a stone which has been lodged in the ureter is not advisable.

Stones in the Lower Two-thirds. It is with the stones situated in the lower two-thirds of the ureter, and especially in the lower one-third, that this paper is most concerned. The pelvic portion of the ureter has but recently come into the field of legitimate surgery. Young states that as late as 1898 Fenger asserted that the lower ureter was beyond the reach of the surgeon. But a short time later, however, it was shown by numerous case reports, to be a field where most successful surgery could be done. Although there are several methods of approach to this portion of the ureter, there can be no question at the present time that the iliac extra-peritoneal

route is the best. It is well, however, to consider the other methods of removal.

The *transperitoneal exploration* of the ureters may be of the greatest value, and, in certain doubtful cases, clearly indicated. The removal of ureteral stones through the peritoneum is not to be recommended as it does not compare in safety with the extra-peritoneal uretero-lithotomy. Kelly was one of the early operators in this field of surgery, and removed successfully two stones by the transperitoneal route. Desquin, quoted by Schenck, has also been successful in a transperitoneal operation. Steward (18), in 1900, discovered a stone in the ureter near the bladder by palpation through the bladder wall after doing a suprapubic cystotomy; some weeks later he opened the abdomen and removed the stone through the peritoneum. The ureter was sutured and the patient recovered without any leakage of urine. Notwithstanding this and other successes, it must be only in occasional instances that one would be warranted in doing a transperitoneal uretero-lithotomy.

The *vaginal* route may be justifiable where the stone is low down and easily felt, and especially where abscess formation is threatened. This route, however, is open to numerous objections: one of these is the great danger of uretero-vaginal fistula; another is the inaccessibility of the rest of the ureter for exploration; and still another is that the stone may slip up out of reach and great injury to the ureteral wall be necessary in order to recover it. In the recorded cases of vaginal operations many more fistulæ have occurred than in the peritoneal or extra-peritoneal operations.

The *rectal* route we believe should never be employed unless an abscess has formed and rupture into the rectum is imminent.

The *perineal*, or *pre-rectal*, route is an old one which has been successfully employed on but very few occasions. It has no advantages over the other operations and is accompanied by much greater difficulty and uncertainty.

Two *posterior operations* have been recommended for the removal of stones occupying the lower ureter. Cabot (19), who was one of the early workers in this field, in 1892 recommended a modified Kraske operation for the exposure of the ureter. Henry Morris more recently has practised in the female a posterior operation: the incision is a long one, parallel with the border of the sacrum and coccyx and extends as far down as the anus. Any posterior operation must have few advantages, and it certainly has serious objections. The wound is always a painful one, it is apt to become infected from the rectum, which itself may be injured, and the opportunity of examining any extent of the ureter is limited. The opening in the ureter is made in the floor instead of in the roof, which we believe is more apt to result in a urinary fistula. The posterior operations also require more mutilation than the anterior.

The *extra-peritoneal iliac* route is the one of choice by practically all surgeons at the present time. Among the first surgeons to use this method successfully were Israel, Twynam, Tuffier, Morris, Finney, Young and Keen. Bardenhauser was probably the pioneer, although his operation in 1882 was a retro-peritoneal one for stone in the upper third of the ureter. The iliac extra-peritoneal method of approach became established about 1900. Young states in his paper, published May, 1903, that there had been done but nine iliac extra-peritoneal operations for stone in the lower ureter in the male by five operators. The surgical literature since this time has contained numerous case reports illustrating the great utility and success of this operation. In Tenney's 134 cases of ureteral stone, there were 34 extra-peritoneal operations with 5 deaths; 3 of the 5 were suffering from anuria when operated upon; one had cystic kidneys; and the fifth a dilated and fatty heart. Much of the popularity of the operation is due to the report of Twynam's (20) case. In 1889 he operated upon a boy, 8 years of age, who had had frequent attacks of pain radiating to the head of the penis and accompanied by hæmaturia. The abdomen was opened and both ureters were examined through the peritoneum. A stone was found below the pelvic brim on one side. The abdominal wound was then closed and the operator conducted a number of experiments on the cadaver in order to decide upon the best means of removing the stone extra-peritoneally. He later performed the iliac extra-peritoneal uretero-lithotomy suc-

cessfully. Rolfe and Godlee (21) about the same time reported a successful case of iliac extra-peritoneal uretero-lithotomy in which the ureter was not sutured. Lister and Godlee (22) had reported a case a few years previously of much the same kind in which the stone was successfully removed extra-peritoneally. Betham Robinson (23) has reported a successful extra-peritoneal uretero-lithotomy for stone in the lower third of the ureter in a three year old child.

The incision employed by the various operators has differed but slightly. As a rule, it has been parallel with Poupart's ligament, and has extended downward for 3 or 4 inches from the anterior superior spine. It is much the same incision as that made for the extra-peritoneal ligation of the iliac vessels. With the exercise of ordinary care it is unlikely that the peritoneum will be injured, as it can be readily separated from the iliac vessels and pelvic wall. The ureter always adheres to the peritoneum when the latter is separated. The exposure of the ureter is most satisfactory, excepting in the portion which lies behind the broad ligament in the female. A stone situated in this position, however, can be passed up into the exposed portion of the ureter and here removed. Some operators have advised crushing a stone so situated between the fingers and thumb and forcing it into the bladder. This we believe to be fraught with considerable danger to the mucous membrane of the ureter and would not recommend its practice for fear of subsequent ureteral stricture. There is practically no hemorrhage accompanying the operation, unless the stone is situated behind the broad ligament; there is little or no damage to important structures; and if the muscles have been separated in the line of their fibres and not crosscut, there is practically no danger of hernia. Another advantage of this route is that in case it becomes necessary, because of lesions in the ureter or kidney higher up, to expose this portion of the urinary tract, the incision can easily be carried up into the loin and the necessary exposure obtained. A small opening can be made in the peritoneum and valuable information and assistance obtained in doubtful or difficult cases. In opening the ureter the incision should be made in its roof, and as so many cases have been reported where no sutures have been introduced, and yet no leakage has occurred, we are inclined to believe that sutures are unnecessary. A small gauze drain should be carried down to the ureteral wound but gauze should not be packed against the ureter, as it rather invites a fistula. If no urinary leak takes place in three or four days, the drain can be removed. The introduction and maintenance of a ureteral catheter beyond the wound in the ureter for the purpose of avoiding a leak, has been carried out on several occasions, but it is an unnecessary procedure in the uncomplicated case. The passage of a ureteral sound or catheter to the kidney and to the bladder, in order to determine whether or not there are other stones or strictures in the ureter is a wise precaution. Force, however, should never be exercised in this exploration and if a stricture is found it should be dilated or incised. Such strictures are most apt to occur in the vesical portion of the ureter and can usually be dilated through a cystoscope. Young has reported a case of this kind. Sampson (24) has performed extra-peritoneal uretero-lithotomy under infiltration anæsthesia.

The *combined intra- and extra-peritoneal* route offers certain advantages over the simple extra-peritoneal operation. Its greatest field probably lies in those cases where the abdomen is opened for some other condition or for exploratory purposes, and a stone is found in the ureter, as occurred in Case 1 of this series. So much help can be obtained in the removal of a stone from the ureter by having a finger or hand in the peritoneal cavity, and so much less traumatism to the ureter is done, that when the peritoneum is open I should not think of closing it until the stone had been removed through the iliac extra-peritoneal incision. As has been shown in the cases reported, it is unnecessary in many instances to make a separate incision. The peritoneum can be easily separated from the wall of the abdomen and pelvis and the ureter exposed. At the time I performed my first operation, which was August 8, 1905, I did not know of any operator having previously followed this plan. I have since discovered, however, that Erdmann (25) on March 11, 1905, accidentally opened the peri-

toneum in doing an extra-peritoneal iliac operation, and then intentionally enlarged the opening, confirmed the diagnosis, removed the appendix and then the stone, just as was done in my first two cases. T. C. Witherspoon (26) in 1904 explored the ureter through a peritoneal incision made through the rectus muscle. A stone was located, the peritoneum was closed, and the ureter exposed extra-peritoneally through the same incision and the stone removed. Hall (27) in 1890 reported a case in which a stone, 3 inches below the pelvis of the kidney, was discovered on exploratory laparotomy. The kidney was then exposed posteriorly and the stone pushed up and removed through the kidney incision. Cabot, in 1892, spoke of the advantages of intra-peritoneal exploration of the ureter in doubtful cases. One of the chief advantages of the combined method, as practiced in my own five operations, is the ability to explore thoroughly the entire ureter on the suspected side and a large part of the ureter on the opposite side. Another advantage is the fact that it is unnecessary for exploratory purposes to separate the ureter from its surroundings to any great extent and that damage to it through rough handling is much less likely. The stone can also be much more readily passed up into a healthy portion of the ureter in the combined than in the simple extra-peritoneal method. The one objection to this method which can be raised is that of possible infection of the peritoneal cavity. By the exercise of certain precautions I believe this can be reduced to practically nothing. My own rule has been not to open the ureter until the stone has been thoroughly exposed and the ureter fixed in the position desired for incision; and that when the forefinger has once been removed from the peritoneal cavity it is not again inserted. When the stone is removed the sutures should be introduced at once or a gauze drain passed down to the ureteral opening. The peritoneum is then closed and the gauze drain brought out at a point as distant as possible from the peritoneal wound. In none of the reported cases of transperitoneal removal of ureteral calculi has there been any infection of the peritoneum. This, of course, does not justify the transperitoneal removal of the stone in the minds of most of us, but it does tend to show that even here infection of the peritoneum is not common, and that the dangers from infection in the combined operation, as was carried out in the cases reported, is very small indeed.

In certain cases it is difficult to locate the stone, and sometimes to find the ureter by the extra-peritoneal route without extensive dissection and a prolonged operation. In such cases an opening in the peritoneum, sufficient to admit the forefinger, greatly reduces the time of the operation and saves extensive dissection. Attention is again called to Case 6, in which two stones were removed from one ureter by the combined operation, and one stone from the other ureter by the extra-peritoneal route, in 30 minutes; and this was not the result of a habit of operating hurriedly, but rather the result of the easy access to the ureter through the described incisions. I do not wish to be understood as advocating the opening of the peritoneum in every case, nor have I practiced this, but in doubtful or difficult cases I do believe that it is a measure which will greatly facilitate the operation, and reduce its complications, especially injury to the ureter. It is unnecessary to repeat the advantages to be derived from the ability to thoroughly explore the entire urinary tract through such an opening.

Stones in the Vesical Portion. Stones in the vesical portion of the ureter may be removed by the extra-peritoneal route, by the vaginal route, by means of a suprapubic cystotomy, by first dilating the female urethra and the use of the finger or forceps, or through the operating cystoscope. Young has shown that the extra-peritoneal route is feasible in these cases and he also demonstrates their removal through the cystoscope. The vaginal route has been a very common one for removing these stones in the female. Garceau (28) has presented an interesting communication on this operation. The vesical portion of the ureter is easily accessible through the upper portion of the anterior vaginal wall; and probably the greatest objection to the operation is the fact that the stone may slip back into a dilated ureter and make its removal difficult without considerable injury to the ureter itself. In case strictures or other stones

are detected higher up in the ureter, access to them through the vagina may be difficult or impossible. Urinary fistulæ following the vaginal operation have not been infrequent, and I believe largely so because the incision is made in the floor of the ureter. In operating through a suprapubic cystotomy wound, through a dilated female urethra, or through the cystoscope, the stone may be grasped in case it projects into the bladder, and thus easily removed; or the ureter may be dilated or incised, and the stone removed with forceps. In all of these operations it is good practice to prevent the forcing of the stone further up in the ureter by digital pressure upon the stone by a finger passed into the vagina or rectum.

The rectal route for stones lodged in the vesical portion is not to be recommended unless an abscess has formed, and perforation is threatened.

In closing I would urge the careful exploration of the ureters in operations for chronic or subacute appendicitis and when on opening the abdomen, no lesion is found sufficient to account for the symptoms.

BIBLIOGRAPHY

1. Leonard, C. L. Lancet, 1905, vol. i, p. 1632.
2. Schenck. Johns Hopkins Hospital Reports, 1902, vol. x, p. 477.
3. Morris, Henry. "Surgical Diseases of the Kidney and Ureter." Cassell & Co., 1901
4. Tenney. Boston Medical and Surgical Jour., Feb. 4, 1904.
5. Bovee. Washington Medical Annals, 1905, vol. i., p. 533
6. Young, Hugh H. Annals of Surgery, 1903, vol. xxxvii
7. Kelly, Howard A. Amer. Jour. of Obstet., Oct., 1901.
8. Deaver, John B. Annals of Surg., 1906, vol. xliii
9. Keen, W. W. Jour. of the Amer. Med. Assn., Aug. 31, 1901
10. Parker. British Med. Jour., July 21, 1902.
11. Fowler, H. A. Annals of Surg., 1904, vol. xl.
12. Noble, C. P. Amer. Medicine, 1902, vol. iv, p. 553
13. Kolister and Schmidt. Jour. Amer. Med. Assn., Nov. 9, 1901.
14. Leonard, C. L. Annals of Surg., 1901, vol xxxiii, p. 435.
15. Osgood. Annals of Surg., 1907, vol. xliv.
16. Brewer, Geo. E. Annals of Surg., 1904, vol. xl.
17. Newman. British Med. Jour., April 21, 1900.
18. Steward. Lancet, 1901, vol. i, p. 1,142.
19. Cabot. Boston Med. & Surg. Jour., 1905, vol. 1, p. 655
20. Twynam. Trans. Clin. Soc., 1890, vol. xxiii, p. 93.
21. Rolfe and Godlee. Lancet, 1889, vol. i, p. 428.
22. Lister and Godlee. Practitioner, 1887, p. 251.
23. Robinson, Betham. British Med. Jour., 1905, vol. i, p. 109.
24. Sampson. Annals of Surgery, Feb., 1905.
25. Erdmann. Annals of Surgery, 1905, vol. xlii, p. 456
26. Witherspoon, T. C. New York Med. Jour., May 21, 1904
27. Hall. Med. Rec., 1890, vol. xxxviii, p. 430.
28. Garceau. Jour. Amer. Med. Assn., Sept. 28, 1907.

THE CÆSARIAN SECTION FROM THE STANDPOINT OF A PERSONAL EXPERIENCE[1]

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WITH the great activity which has been displayed in the development of the Cæsarian section during the last few years, there seems to be considerable danger that the operation may be over-exploited in the next few years. Its wise use must depend upon the proper selection of appropriate cases and upon the rejection of cases which are for any reason unsuited for it. A consensus of opinion upon these points can be reached only by the combined work of many men and the final judgment of the general profession thereon. To this growth each of us can but contribute his personal opinion and experience, and as such a contribution this paper is intended. I feel that I must apologize for the somewhat profuse use of the personal pronoun in the first part of it but I was not able to see how I could avoid this in a paper based upon personal experience and at the same time make the points which I wished to make without tiresome circumlocution. I shall cheerfully accept any criticism of literary style which may result from this if I can succeed in making my points more clear.

The methods of practice which I wish to present to you are based upon beliefs that the mortality of the Cæsarian section varies so greatly in accordance with the period of labor at which it is performed that — First — The mortality of the section late in labor is too great to permit of its performance in the interests of the child alone. Second — The maternal mortality of the section performed even so early as at the end of the first stage in labor is greater than that of any ordinary high forceps or version. Third — The mortality of the section done at the time of election in advance of labor, or at its very beginning — The Primary Section — is so low that it is a safer operation for both patients than difficult high forceps or version when performed for mechanical obstacles.[1]

[1] I am necessarily excluding from consideration cases in which either form of operation is performed for other than mechanical obstacles.

These principles are founded, first, upon my own experience, second, upon the results of a constant inquiry into the difference between the mortalities of late and early Cæsarian operations, which I have been interested in keeping up in my own reading for more than ten years, and, lastly, and I think least valuable, upon a statistical inquiry into the general literature of the last ten years, which I have recently made and published[1] and shall quote again here.

My first point must therefore be a brief statement of my own experience and of the results of this statistical study.

My own experience with the section now comprises thirty cases, all without mortality. It has been one-sided, since it includes but one case which could by any possibility of construction be considered late, and that patient, though she had been through a very long first stage, was in good condition and showed no sign of exhaustion. It has been thus one-sided because an analysis which I made and published in the early 90s before I had myself done the operation, and which I think included all the cases which had then been done since the revival of the operation, had convinced me even at that early date that the mortality of the section was chiefly confined to infected and late cases. I believe it to be because of this one-sidedness that I have an unbroken record of success. I have, nevertheless, noted even in my own experience that the smoothness of convalescence, the comparative absence of discomfort to the patient, and the absence of anxiety to myself have been marked in the cases done before labor, and in the other cases have varied in proportion to the extent of labor permitted before operation.[2]

My own experience and general studies of the literature of the subject have alone been suffi-

[1] Read before the New York Academy of Medicine, February 6, 1908.

cient to bring me to a firm belief in the propositions which I have stated above and am endeavoring to support, but since this is necessarily less convincing to others, I have recently obtained the reports of all the cases in the world's literature which the officials of the Boston Medical Library were able to find for me, and have made and published[1] an analysis of all the cases operated upon in the last ten years by operators who had done at least five sections and which were published in sufficient detail to permit their classification into the necessary three classes of cases; those done before labor, early in labor, or late in labor; which three classes I have ventured to call primary, secondary, and late sections. I excluded from the list all cases which were done for other than mechanical indications, e. g., for placenta prævia, eclampsia, fibroid tumors, etc., since these are plainly foreign to an inquiry into the mortality of the section when done for mechanical indications only. I included all other cases and assigned them to their final place in the three classes spoken of before noting their mortality. My completed tables contained 289 cases operated upon by twenty different operators; of these 82 were primary, 158 secondary, and 49 late.

The 49 late cases showed a mortality of over 12 per cent in spite of the fact that I included in this class all cases in which the os was above the size of a fifty-cent piece, or in which even trifling pains had been present for twenty-four hours, thus putting into it a large number of cases which really belonged to a comparatively favorable class.[2]

The 158 cases classed as secondary were all done during the first stage of labor, none had had even six hours of strong pains or twenty-four hours of even trifling pains; they were therefore very favorable cases, yet their mortality was 4 per cent (6 deaths 3.8 per cent).

The 82 cases done before labor, or with the advent of the first pains, yielded one death, a mortality of slightly over 1 per cent (1.2 per cent) and would have been absolutely clear of mortality had I felt at liberty to exclude this one death, as not only due to an accidental technical slip, but as furthered by the incompetency of an assistant during convalescence. It is, however, a death which must be attributed to the operation and must be tabulated as such.[3]

Even including this accidental death the figures above (1, 4, and 12 per cent) are in marked contrast when we remember that the three sets of cases were operated upon by the same operators and under the same conditions, differing only in the time selected for operation.

This statistical inquiry was conducted with the greatest care to prevent its results from being influenced by my pre-existent convictions, in spite of which care they are so strikingly in accord with my personal experience as to have strongly re-inforced my belief in the three propositions which form the burden of this communication, to which I may now proceed.

One of these;— that the classical Cæsarian section performed late in labor is an ultra dangerous operation;— will be received with little question, and for lack of space must be here dismissed with but scant consideration, for which reason, I undertake it first.

This fact, though generally recognized by operators of large experience, has been so little realized by the masses of the profession that it deserves prominent emphasis in every communication upon the subject made to-day. It is safe to say that there is no operator of experience who is not fully aware of the dangers of the late section.[4]

But the occasional operator has not yet grasped it, and the country is still full of general practitioners who look upon the Cæsarian section as an operation which may be resorted to after all other expedients have failed, and of surgeons of little obstetrical experience who are cheerfully ready to perform it under such conditions. The blame is not to them. The blame is with the obstetrical specialists who recognize the dangers of the late section, but

[1] Loc. cit.

[2] The mortality of really neglected cases would be very much higher.

[3] The uterus was sutured with catgut, the sutures became untied (it was nearly ten years ago when catgut was not knotted as it is to-day) the patient collapsed, the operator was at a distance, the assistant saw the patient still in fair condition, but pronounced it a mere nervous attack, unworthy of treatment; and the autopsy showed the uterine wound gaping and the abdomen full of blood.

[4] The percentage of late operations is steadily decreasing among operators who are able to publish lists of any length; and although the choice between the Porro operation, the very unsatisfactory divisions of the symphysis, and the disgusting operation of craniotomy is till sub judice for these unfortunate cases, it is safe to say that there is no operator of experience who is not fully aware of the dangers of the late section.

have failed to emphasize them sufficiently in their teachings.

The late section may still be justifiable in some cases, but its mortality has not been lessened by the success of the early section, it is still an ultra dangerous operation, and should always be explained to the family as such. If it were fairly so described it would be but seldom performed. I believe that future progress in the use of the Cæsarian section will consist in an increasing limitation of the late section and a corresponding increase in the use of the early section.[1]

My remaining propositions are, in slightly altered words,— First — That a section undertaken under every surgical advantage in advance of labor is less dangerous than one performed after even a few hours endurance of the exhausting physiology of labor, and under the technical conditions incident to such work. Second — That the section performed after a full test in labor has demonstrated the approaching failure of the natural forces is an operation favorable to the child, but much more dangerous to the mother than the intra-pelvic methods of extraction by high forceps or version.

If it is then true, as I believe has been demonstrated, that in cases operated upon by the same operators and under the same conditions the mortality of the section is closely proportionate to the length of labor endured before its performance, there can be no plainer or more obvious deduction than that *when the Cæsarian section is necessary, it is desirable that it should be determined upon in advance, and performed as a primary operation.* Few obstetricians and still fewer surgeons will deny this almost self-evident proposition as a matter of theory. To secure the advantages of its application to practice we must be able to demonstrate the possibility of predicting in advance what the result of labor will be with sufficient accuracy to warrant the performance of the Cæsarian section.

I believe that this is possible in the large majority of all cases. He would be a fool who attempted to deny that doubtful cases exist, probably must always exist, and must be treated as doubtful cases, but this fact should not hamper our action in cases which are not doubtful. There are cases which are clearly Cæsarian, cases which are doubtful and cases for which the Cæsarian need not be considered, but it is all important that we should separate these three classes.

I believe that in the best-trained hands the doubtful class is now a small and constantly decreasing one, and at alll events it is no credit to the profession that for many years its obstetrical members have been content to rest upon the accepted statement — "We cannot predict the results of labor in advance" — and have made no serious effort to attain that much needed capacity.

The primary Cæsarian section is to-day probably comparable in its mortality to the operation for appendicitis in the interval, and there are at least a very large number of cases of mechanical obstruction in which we can to-day predict the result of labor with a sufficient degree of accuracy to warrant us in doing the section at that safe time, upon the same principle on which we do our interval appendectomies, i e., to warrant in us subjecting the patient to a safe operation in order to avoid the probability of a far more dangerous operation a little later.

We all remember the days when a projected Cæsarian section was sometimes forestalled by the rapid spontaneous delivery of the patient before the operator could get to her. Those were the days when the indication depended upon the mere size of the conjugate by measurement. Those days are no longer with us, we have already a much better understanding of the indications, and such cases as these would now be placed in the doubtful class for whom the primary section should not be advised. We can to-day at least divide our cases of mechanical difficulty into the one class in which the question of the probable result in labor lies between a spontaneous and an operative delivery, and the other class in which the question is only between the intra-pelvic operations and the Cæsarian section.

Most operators of experience are now agreed that a primary Cæsarian section is a better

[1] [illegible] choice between the revolting, but maternally safe, operation of craniotomy; the rather unsatisfactory divisions of the symphysis; and the original Porro operation, for which there is perhaps a future; is an obstetrical question of much interest, the discussion of which would involve too much space to be permitted here.

operation for the patient than a difficult high forceps or version, on the ground that we all know that difficult intra-pelvic operations for mechanical obstacles not only have a large fœtal mortality but are by no means without maternal mortality, and have also a very great maternal morbidity; while the Cæsarian has an equally small maternal mortality, and, speaking broadly, no fœtal mortality or maternal morbidity.

I should be glad to quote briefly a few cases in illustration of my own experience on this point.

Case 1. Dec. 1895. Mrs. C. S. 30 years. 2-para. First child still after operative labor in another city. A large, stout, rather pale woman, indisposed to exertion, easily fatigued, and easily put out of breath. Normal urine and no abnormal heart sounds. Pelvis probably somewhat scant, but not recognized as "contracted" by measurements. Inclination of brim excessive. The pains were lingering and ineffective and after a somewhat long first stage of labor, both maternal and fœtal pulses rising in rapidity, forceps applied and living child extracted. The perineum which had been repaired after a bad laceration in the first labor was again extensively torn, with free, though not alarming, hæmorrhage from the torn surface. Its repair occupied considerable time during which the patient was held under ether. She had been cleaned up and turned around in bed but a few minutes when I noticed a sighing respiration and great pallor. The respiration rapidly became worse, the pulse was within a few minutes almost indistinguishable, and death occurred in about twenty minutes. No autopsy was permitted. It is possible that there was an embolism, but I think that the death was the result of long labor, prolonged use of forceps, considerable hæmorrhage, the shock of forcible extraction and extensive trauma, and perhaps an unduly long etherization, in an anæmic patient with in all probability a flabby, if not an actually fatty, heart muscle. I believe this case to be an instance of the dangers of difficult intra-pelvic operating, extensive trauma and its repair, in patients who have not been properly watched and prepared for labor during pregnancy. I had even then had a large experience in labor, I hope that my care of this patient was up to the standard of practice at that day, but I believe that this labor could be a great deal better managed at the present time.

Case 2. May 1905. Mrs. M. F. 37 years. 2-para. Seen with Dr. S. A. Houghton. First child stillborn in operative labor. Referred to me when two months advanced in second pregnancy. Watched through pregnancy and delivered with Dr. Houghton at term.

A large and strong looking woman but with a history of ineffective pains in the first labor, a condition of tonic constriction occurring early. In this first labor the cord prolapsed and stopped. The hand introduced through the os to replace it found the uterus rigidly applied to the child. The child being dead and the conditions difficult it was very wisely decerebrated to facilitate its extraction, which was then easy. Weight ten pounds. Dr. Houghton was confident that had the soft parts been in proper condition a living child could have been extracted by version.

My examination of her pelvis during her second pregnancy was as follows — legs bandy, sacral and lumbar curves excessive, inclination of brim extreme, length of symphysis 7 cm., inclination increased, promontory high, crests low but curves normal, external measurements normal, diagonal conjugate not less than 8.5 cm. Owing to great inclination of symphysis, true conjugate estimated at same size. On examination under ether at term, the adaptation between head and pelvis did not seem excessively difficult; in view of the extreme inclination of the pelvis I was inclined to favor the Cæsarian but in view of Dr. Houghton's wide experience, known skill, and previous experience with the individual pelvis in labor, attached much weight to his opinion that the delivery of a living child by version would be possible. The patient and her husband were opposed to the Cæsarian, and would not consent unless I was ready to assure them that it was the only method which offered any prospect of a living child. After long consideration we decided upon version, and in view of the previous behaviour of the uterus and some features in the condition of the patient, I recommended that it be done as a primary operation. The cervix was dilated with the greatest ease and the child was easily turned but the extraction of the body was exceedingly difficult, the head followed easily. The child was evidently completely exhausted by the exceedingly difficult extraction of the body; it was resuscitated with great difficulty and died after a few hours. The vagina and perineum were extensively lacerated, the perineum through the sphincter, probably during the extraction of the arms, which was very unusually difficult, and the patient had a troublesome incontinence of urine for many weeks after delivery. Although this disappeared spontaneously and I was fortunate enough to secure complete repair of the perineum by a primary suture, neither of these are results which could ordinarily be counted upon, and the net result of the case was a stillborn child.

This case formed a turning point in my obstetric growth. I had then done 26 Cæsarian sections and a very large number of intra-pelvic operations. From the intra-pelvic operations I had had a very few maternal deaths, a much larger number of stillbirths, and a great number of lacerations of a degree sufficient to be rated as furnishing subsequent morbidity, but I had had a very great number of completely successful cases. I had nearly reached the position which I now take, but this case crystalized my views. I am still a very strong believer in the use of the intra-pelvic methods both as primary and secondary operations in mechanically easy cases; but this case is, and I hope and believe that it will always remain, the last case in which I have ever adopted an intra-pelvic operation which I had reason to believe would be

mechanically difficult, at a time when the clean, certain, surgical, primary Cæsarian section was still open to me

Case 3. Mrs. P. S. Seen with Dr. C. W. Townsend Dec. 6 1899. 3-para. Details of former labors unknown but not markedly difficult. 40 hours in labor when first seen. Head high, os partially dilated, membranes unruptured, no progress for many hours, patient tired. Forceps failed after several applications. On passing a hand into the uterus shoulders held by firm constriction ring. Version performed. Turning difficult, extraction easy. Soft parts very friable, moderate tear of perineum, several small tears of vestibule. Small hematocele developed in left labium. No urine for twenty-four hours, then soft catheter passed by nurse yielded nothing but dark blood. Patient then seen again with Dr. Townsend. Urethra evidently lacerated in delivery. After much study left side of urethra was found to be intact and catheter was passed to bladder. Hematocele between uterus and bladder and larger than uterus. Patient exsanguinated, condition somewhat critical for several days but made gradual and smooth recovery.

Seen again with Dr. Townsend in fourth pregnancy April 1904. Upper part of anterior vaginal wall somewhat œdematous and cicatricial. Pelvis of normal diameter but with much increased inclination of brim and symphysis. Head high and coaptation to pelvis tight. In view of history of last labor recommended Cæsarian. May 4, 1904, Cæsarian performed. Operation easy, recovery prompt and uneventful.

To sum up the objections to the intra-pelvic operations.

Upon the maternal mortality of high forceps and version I have been unable to find any statements which are at once authoritative and recent. It is certainly not high. In a very large personal experience, which I could not now analyze without excessive labor, I am able to remember but two deaths in cases operated upon for mechanical reasons only, and in an analysis of results at the Boston Lying-in Hospital made ten years ago I collected seventy-five consecutive cases with no deaths. A search of the more recent text-books has failed to show any exact statement of modern results, those authors who mention the maternal mortality at all usually contenting themselves with statements to the effect that, though undoubtedly existent, it is also undoubtedly small. It is probably about equivalent to that of the primary Cæsarian section.

The fœtal mortality of these operations is, however, frequently referred to in the same works and in operations done for mechanical obstruction is placed at an average of at least from 20 to 25 per cent.[1]

Their maternal morbidity is plainly not a subject capable of statistical determination, but is fortunately not a subject which needs debate.

Any operator of extended experience who will devote but a short time to a review of his cases will remember many instances in which the resulting trauma was so extensive as to result in morbidities requiring secondary operation, and probably some in which even successful repair was followed by the prolonged or even permanent persistence of some disability. As a gynecologist I have for instance seen and operated on a number of cases of prolonged incontinence of urine after such injuries, though, with the exception of the case quoted above, I have been fortunate in escaping it after my own extractions,[2] and this is but one of many such morbidities.

In contrast, the results of the primary section when performed on healthy women for merely mechanical obstacles are the highest possible degree of safety for the child, a maternal mortality risk which is probably not greater than that of difficult high forceps or version, and an entire absence of the extensive vaginal trauma, and consequent morbidity, a percentage of which we know to be inseparable from the difficult intra-pelvic operations.

For these reasons the primary section is preferable for most cases of mechanical difficulty in which the conditions are such that we can know beforehand with a fair degree of surety that we are going to have an operative labor and that our choice lies between the primary section and the intra-pelvic operations with all their uncertainties.

We cannot, however, always make an assured decision before labor, there will be doubtful cases, and the decision in favor of a primary section is always a responsible one, but that is no reason why we should shirk it. We are here to take our responsibility as surgeons, to stand or fall by the success of our results. I cannot criticise those who still believe that the section after a moderate first

[illegible]

proportion of all obstetric injuries.

stage is an operation with little or no mortality, but he who has once attained the belief that a clean surgical incision and suture under all the advantages of an operation at the time of election is a safer operation than a section in the midst of labor and the exhaustion of labor, and who then from vacillation or timidity deliberately chooses beforehand to risk that secondary section has undoubtedly failed in his duty.

I am fully aware that if such statements as these attract any attention, their publication involves to the men who make them a certain responsibility for the unnecessary operations which are always performed by half qualified persons during the initial stages of any advance, but I feel that if we can succeed in drawing attention to the enormous mortality of the late section, and the not very small mortality of the secondary section, the lives which will be saved by refusing unnecessary abdominal deliveries under these circumstances will more than make up for the very small mortality which may follow upon the few unnecessary primary sections.

We must next consider the choice between the intra-pelvic extractions and the secondary Cæsarian section.

The secondary Cæsarian section, — i. e., the section performed as soon as possible after the test of labor has demonstrated the mother's inability to accomplish a spontaneous delivery, — has a considerable maternal mortality, (as judged from the statistics quoted above perhaps from 2 to 4 per cent) certainly a higher maternal mortality than the intra-pelvic operations, and an absence of maternal mortality should be our first consideration. I would therefore rule out the performance of the secondary section as an operation of choice; — but here I must explain myself — If called during the first stage of labor to a case in which the delivery of a living child seems otherwise unlikely, I never have and so far as I can see now never shall deny the opportunity of the early secondary section with its safety to the child and its comparatively small risk to the mother to patients who accept its performance in the interests of the child, after they have been warned that it has a moderate maternal mortality, but I would rule it out as an operation of choice for cases seen before labor.

It remains for me to speak in such form as I can of the means at our disposal for the proper selection of cases, but a full discussion of this subject would occupy a monograph, and no small one at that; it is only possible here to outline in the briefest way the principles by which I think that we should be guided.

To attain to any accurate predictions of the probable result of labor demands that each of the three mechanical factors in labor should be estimated with a degree of painstaking care which is to-day seldom practised. The mistakes of the past have been due chiefly to an over-dependence on measurements of the pelvis alone and to over-confident attempts to determine this important question at a single sitting.

To attain really accurate results we must estimate with equal care the *pelvis*, the *passenger*, and the probable *maternal power* as a propelling engine; moreover, to attain any just estimate of any one of these in difficult cases it is usually necessary to see the patient repeatedly during pregnancy, and when it is possible before pregnancy.

In estimating the capacities of the pelvis we must wholly drop the idea that this determination can be made by measurements alone. Pelves vary greatly in shape and consequently in mechanical efficiency even within the normal limits, and of course in pathological examples vary even more widely. They also vary greatly in size. With ample pelves the ordinary variations in shape are of comparatively little moment, but the combination of merely scant normal size with variation, even within the normal limits, towards one of the more difficult shapes, may often make a pelvis in which the birth of a large head may involve really great difficulty. These are the pelves which produce a succession of difficult labors, and often stillbirths, in spite of essentially normal measurements. In the study of the pelvis we must then aim to determine shape as well as size, and we must do this by every means at our disposal.

When it is possible to see the patient in a non-pregnant condition something may possibly be gained by the study of the pelvis with the X-ray provided that one has access to a Roentgenologist who is possessed at once of the electrical equipment and of the high degree

of technical skill which is necessary for this very difficult work. Great care must be observed, however, both in the use[1] and in the interpretation of these skiagraphs, which are often very misleading. The interpretation of the mere curves needs experence, and both the dimensions and the proportions need to be carefully corrected by calculation on optical principles before they can be at all trusted.

The external measurements as ordinarily taken give valuable indications as to the form of the pelvis, but must be supplemented by others, i. e., by measurement of the height of the line of the anterior superior spines above the pubes, of the length of the sacrum and symphysis; and by observation of the inclination of the symphysis, of the inclination of the sacrum in correlation with the lumbar curves, and the inclination of the pelvic brim as seen with the patient in the erect position. These must be checked by observation of the correlated peculiarities of the lengths and curves of the patient's whole skeleton. All this must be supplemented by careful external and internal palpation of the walls of the pelvis on all sides with the trained hand before even an approximate estimate of its shape can be made. Finally we should resort to the one measurment which is diagnostic of size in the ordinary deformities, i. e., the internal conjugate as estimated from the direct measurement of the diagonal conjugate, and should then consider the importance of the size obtained in connection with the shape as diagnosed.

A normal pelvis can usually be determined as such in one visit, but the determination of the amount of an abnormality usually means several interviews, and much study.[2]

The whole matter of the estimation of the shape of the pelvis is as yet in its infancy. It is not now a matter of general professional acquirement, and it probably will not be for many years in a condition in which it can be taught to students or obtained by any other means than the slow training of hand and eye which comes from faithful study of large numbers of cases, but given this pre-requisite it is certain that the knowledge gained by faithful and repeated estimation of a pelvis along these lines is already of a different class from that which follows upon mere measurements.

The probable propelling power of the patient's uterine muscle is of as much importance as the shape and dimensions of her pelvis and the size of her child, that is, a size and shape of pelvis which will permit the passage of a given head with entire safety to the mother after it has been molded by efficient and powerful uterine contractions may be impassable to the same head either by spontaneous delivery or by the intra-pelvic operations in the absence of propelling power sufficient to effect the needed modifications of the shape. It is, moreover, a much neglected fact that the uteri which fail to give obstetrically efficient contractions pass very early in labor into a spasmodic state which annuls their subsequent efficiency, and that the possessors of such uteri uniformly become exhausted early by their inefficient efforts. The study of the propelling power of the uterus is then a matter of the most absolute importance. It may be estimated in advance in two ways. First, and most valuable, by the history of previous labors in multiparæ. In my own experience nothing has been more definite than that the muscular character of labor rarely varies in kind in the different labors of the same woman, though it may be altered in degree by care, or absence of care, of the general condition throughout pregnancy. The woman who has once had strong, successful, sthenic labor will always have propulsive pains. They may be less good if she is allowed to come up to labor in an exhausted condition, but they will always be propulsive pains. Such a woman will overcome any moderate obstacle. Upon the other hand, a woman who has once had a labor characterized by lingering, irregular, ineffective, and excessively painful uterine contractions will never have strong, sthenic, successful labor. Such a uterus may act much better if the muscular and metabolic condition of the patient has been successfully cared for throughout a subsequent pregnancy, but the change will be in degree only. In such women

[1] [illegible] patient. It is improbable that a single exposure could interrupt fertility, but this possibility must be borne in mind.

[2] [illegible] estimation of the degree of some forms of deformity can be made best [illegible] turbed. The other measurements can be made at any time, but the measurement of the conjugate can seldom be accomplished with accuracy until towards the latter part of pregnancy, unless in very small pelves or with exceptionally long vaginæ; hence the necessity for several examinations in really difficult cases.

exhaustion sets in early, and very moderate mechanical obstacles may be relied upon to prove effective. In multiparæ the history of uterine effectiveness in past labors must therefore be carefully taken and estimated, and before the final decision is reached at the end of pregnancy the history of past effectiveness must be checked by consideration of the patient's general condition then, as compared with that observed before her previous labors.

Even in multiparæ who have been carefully examined, and watched throughout pregnancy, the class in which the choice of operation is doubtful will perhaps still exist, but in them it should be an exceedingly small one.

With primiparæ our power of predicting the probable muscular character of labor is very much less, but even with them it is not wholly negligible. Lack of space must prevent my entering here into a full discussion of a proposition in which I heartily believe, that we can within certain limits predict the muscular character of labor as likely to be propulsive or ineffective, at all events in the more extreme cases, by observation of the woman's progressive loss or gain during pregnancy, more especially since I have published that argument set forth in full to the best of my ability within a year, but even with every advantage in the way of observation a really valuable prediction of the probable muscular character of labor is much less easy in primiparæ than in multiparæ and must be limited in primiparæ to marked cases.

In primiparæ, then, I believe that we must recognize as yet the existence of a considerable class in whom the decision for or against the primary section will remain doubtful, but I believe that the limits of that doubtful class can be somewhat narrowed by careful estimation of the probable character of labor, i. e., by adding to the class who should be left to labor and the intra-pelvic operations, those women of doubtful mechanical obstacles from whom powerful labor may be expected; and by adding to the Cæsarian list, with somewhat more caution, those women with doubtful mechanical indications who have run down in health during pregnancy so markedly that there is but little chance of their having effective contractions. In arriving at the final decision it must be remembered also that women of the powerful, sthenic class are surprisingly little injured in after health by the consequences of labor, but that those of the other or ineffective class endure surgery sufficiently well and labor badly.

Even in primiparæ therefore a cultivated power of estimating the probable muscular character of labor must be one of the acquirements of the thoroughly equipped obstetric surgeon.

Our only reliable evidence of the size, degree of ossification, and, in short, the mechanical qualities of the fœtal head is that obtained by combined external and internal palpation as it is crowded into the pelvis by pressure from above. In cases with marked alterations of the pelvis mere palpation of the fœtus and of the fœtal head without such pressure during the last two months may often show that it is of a size beyond the powers of the given pelvis, but in doubtful cases the decision must be left to a final pressure examination under anæsthesia,[1] and at term, when the head has attained its final characteristics, and when the examination can be pushed to its logical extreme unhindered by the probability that it may induce labor.

In conclusion of this portion of my subject, I believe, then, that to avail ourselves of all the resources of our art in the management of difficult labor we should see the patient at intervals during preganacy and where circumstances render it possible before pregnancy[2]; that the shape as well as the size of the pelvis should be estimated by every possible means at our command, and if necessary by comparing the results of repeated examinations; that the progressive changes in the patient's general condition throughout pregnancy should be watched by repeated medical examinations, each of which should include an analysis of the twenty-four hour specimen of urine, and in the last six weeks of pregnancy palpation of the fœtus; and that in the considerable proportion of cases in which doubt must still remain the decision should be made in accordance with a final examination under anæsthesia at term.

[1] [illegible]

[2] I. e., in cases where the unfortunate history of previous labors or the existence of evident deformity have brought the question of safety of labor into consideration before another pregnancy has occurred.

This examination may be instituted either at or about the calculated date of term, or with the advent of the first pains of labor, in accordance with the opinion of the individual operator. In either case it should be preceded by careful preparation of the vagina and abdomen as if for a total hysterectomy; and the patient should be anæsthetized and placed upon the table with good light, abundance of assistance, and in short all the advantages of modern major surgery. Under these conditions I believe that a competent operator may safely pass his fingers into the vagina, and if necessary within the uterus by dilatation of the os, without compromising the safety of a subsequent section. With the fingers in this position,and if necessary with the half hand in the vagina, he can pass them over practically the whole surface of the head, and with the estimate of its shape, size, and degree of ossification which he can so obtain, aided by observation of the adaptation between the pelvis and head when the latter is forcibly pressed into the brim from above, a competent observer will reduce the mechanically doubtful class to a very small number.

The results of this examination should then be considered in connection with the general information which has been already gained and in multiparæ with the history of past labors. Every obstetrician knows the degree to which this can be depended upon and is aware of the necessity for allowing for occasional exceptions, but the best proof of the pudding is in the eating, and when the actual test in labor has shown such a degree of difficulty in the passage of the bones as to result in even one difficult operative labor with a stillbirth or excessive trauma, the probability of the same result in another labor is so great as to make version or forceps with their uncertainties to both mother and child less advantageous operations for that case than the primary Cæsarian section with its absence of morbidity and probably not greater maternal mortality.

Two provisos must, however, be understood. First,— In pelves which have permitted the extraction of living or even intact children the possibility of a smaller or less well ossified head must not be forgotten in the management of the second labor. The patient's mind should be prepared for either operation, and the final decision should not be made until after a final examination for adaptation, under anæsthesia, and at the time of election for operation. Second,— When the patient has had but one labor, the obstacle which is caused by bony deformity, and that which is due to the rigid soft parts of primiparæ must be estimated separately, and due allowance made for the diminution of the latter in a second labor.

After all these methods have been employed a final decision should be made and rigidly adhered to; i. e., if it is in favor of the Cæsarian this should be at once performed; but, if on the other hand, the case is thought better fitted for labor and the intra-pelvic operations, the patient should be given a full test in the second stage of labor; after which the Cæsarian is the more dangerous procedure and if any operation becomes necessary it must be forceps or version.

The fault in our past management of the Cæsarian operation has been that we have too often adopted or refused it without sufficiently painstaking observation, and also without a full recognition of the superior safety of the primary section. Of course such detailed observation of pregnancy as has been described and such painstaking investigation of the mechanical conditions would be manifestly impracticable, and indeed unnecessary, in the routine practice of obstetrics in multiparæ. It is applicable only to cases in which difficulty can be reasonably expected.

How then should we decide in which cases such care should be used? This is from a practical standpoint the crux of the entire question, and is one which involves the education of the public and the general profession to a realization that the old basis of practice,— i. e., a belief that the majority of labors turn out all right and that the few catastrophes which occur can only be regretted,— it is not in accord with the spirit of modern medicine which demands that even rare, avoidable catastrophes must be foreseen and prevented.

We must teach the general practitioner also that in difficult labor no obstetrician, however skillful, can obtain a low percentage of mortality, fœtal or maternal, if he is only called in after arrest has occurred.

It is not in the least necessary that all labor cases should be referred to specialists, but we must teach the general practitioner how to select the cases in which danger threatens but may be forestalled by an early and accurate comprehension of the circumstances.

All primiparæ ought really to be examined for determination of the mechanical conditions during pregnancy, and the more intelligent portion of the laity would be already prepared for such a routine if the profession were ready for it; moreover, in the case of women with plainly normal conditions that fact is soon apparent, the examination need not be unduly tedious or exacting, and this custom of a routine examination of primparæ is evidently growing in repute — each year certainly brings to my office a larger number of primparæ who are advised to come simply to make sure, and without any real apprehension of difficulty,— but it is not well to try to effect too much at once, and to those practitioners who are not yet convinced of the necessity for a routine examination of all primaparæ, we ought at least to insist upon the necessity for determination of the mechanical conditions during pregnancy in all primiparæ whose general appearance suggests the possibility of mechanical difficulty, and in all multiparæ who have had difficulty.

All primiparæ of very small stature *should have a determination of the mechanical conditions during pregnancy.* It is in this type of women that the symmetrically small pelvis, the pelvis nana, is to be looked for.

All primiparæ who have done heavy muscular work during the period of development, and more especially all of these who present a short, squat, short legged appearance *should have a determination of the mechanical conditions during pregnancy.* It is in this class of women that the flat pelves are particularly frequent.

All primiparæ with the narrow hipped, long straight legged, flat backed, boyish type of figure *should have a determination of the mechanical conditions during pregnancy.* It is in this type of women that the true justo-minor or neutral type of pelvis is especially frequent.

All primiparæ with bandy legs, protruberant buttocks, prominent abdomen, and unusually hollow lumbar region *should have a determination of the mechanical conditions during pregnancy.* Such women are often rather wide hipped, markedly feminine in figure, and at first sight suggest favorable labor; but it is in such women that pelves with excessive inclination of the brim and exagerated curvature of the pelvic axis are mostly found. This pelvis has attracted no attention until of late years. It is frequently of good size and is then unimportant, but its shape is such as to make very slight diminutions of its size productive of an unexpected degree of difficulty in labor, and it is therefore worthy of note. These pelves are the more important in that in them the intra-pelvic operations have necessarily a very high fœtal death rate, and a very high maternal morbidity rate.

All primiparæ of delicate general health *should have a determination of the mechanical and constitutional conditions during pregnancy.* Many of these women have easy labors but in them even moderate mechanical difficulties assume importance, and, moreover, the medical over sight of their pregnancies always demands great care.

Multiparæ who have had easy previous labors demand no special care, but all multiparæ who have had even one difficult or disastrous labor *should have a determination of the mechanical conditions during pregnancy.*

Few men will doubt the wisdom of these propositions when placed before them on paper, but to effect their present adoption in practice is quite another matter. To practically secure this benefit to humanity we must look to our own conduct, we must teach the general practitioner that to seek such an opinion during pregnancy does not mean that the specialist will assume the charge of a normal labor if his examination shows such to be the probable outcome of the case.

It is a fact that twenty-five years ago the care of normal labor by practitioners who were otherwise well equipped, was frequently so poor as to furnish a basis for the position that all labor should be attended by specialists, but this is not the case to-day. With the advent of asepsis and with what I believe to be the general advance in professional equipment and sense of responsibility for results, the average of obstetric practice has risen greatly,

and there are to day great numbers of practitioners who are quite sufficiently equipped for the intelligent care of ordinary labor, and for the performance of the ordinary obstetric operations. We ought to recognize this change. In all other specialities the conditions of practice have taught us the necessity of not absorbing the management of cases which are referred to us merely for an opinion.

If the obstetrics of the future is, as I believe, to assume a more desirable position as a speciality than it has ever heretofore held, it will be in part because of the change which is coming over our methods of practice; and in part because its practitioners will find themselves not only forced but glad to assume the position characteristic of all other specialists, i. e., those younger obstetricians who desire to take charge of normal labor will probably always take such cases from practitioners who do not attend labor, but I think that established specialists will in the future decline normal labor.

The great majority of general practitioners now desire, and probably will always desire, to attend the ordinary labors which occur in the course of their practice; on the other hand, they are not, and they know they are not, at present competent to make a really thorough determination of the mechanical conditions during pregnancy, It is then setting a very high, and it is to be feared an impossibly high, standard of conduct, to expect them to refer any considerable proportion of their patients, even for an opinion, to men who are their most dangerous competitors for the care of normal labor. When obstetricians are ready to take the posiion that under the conditions of to-day attendance on normal cases does not demand a mysterious and unrecognized special knowledge, they will find that the general practitioner is more than ready to seek their advice on the exceptional cases whose results are so apt to be unfortunate, and that he will be ready to seek such advice in advance, or at any other period which the specialist may recommend. The moment this is the case there will be an abundance of work, and of high class work for the professed obstetrician in attendance upon difficult cases whose difficulty has been determined in advance.

PROLAPSE OF THE FEMALE URETHRA

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IN the female urethra it is not altogether uncommon, on the one hand, to find slight eversion of the mucous membrane lining it, more especially in parturient women. On the other hand, it is rare to meet with cases in which the mucous membrane projects to such a degree as to give rise to a distinct bulging or tumour.

A multiparous patient, age 56, came under notice, complaining of hæmorrhage and pain on micturition. The attacks of hæmorrhage were periodic and varied in severity; latterly, an attack, lasting for an hour, compelled the patient to seek advice. She had always suffered from chronic constipation of a most persistent nature and, owing to no less than three attacks of nephritis during the last five years, had been in a feeble state of health. On examination, a red mass, about the size of a large cherry, was seen protruding at the meatus urinarius, which turned out to be the mucous membrane of the urethra, very red, congested, and sensitive to touch. In the middle of the mass an opening was visible from which a clot of blood projected; and a sound, introduced at the opening, passed up into the bladder. Vaginal examination presented nothing abnormal, the cavity being moderate in size and the uterus small and atrophied. The patient was anæsthetised and placed in the lithotomy position, and reduction of the displacement was first attempted. On this being found impossible, the prolapsed mass was removed by scissors, the hæmorrhage, as

might be expected from the vascularity of the mucous membrane, being rather profuse. The mucous membrane was then united to mucous membrane all round the uretheral orifice, a catheter having been previously introduced to keep the canal patent. A dressing was applied and kept in position by means of a bandage, and the patient put back to bed. Two days after the operation she was able to micturate, and ten days later the uretheral orifice had completely healed, and no pain or discomfort was experienced on micturition.

On microscopical examination of a section, made through the whole thickness of the mass which had been removed together with the uretheral orifice embraced by it, it was observed to consist chiefly of angiomatous tissue, which appeared in the tissue as small, separate collections. These angiomatous nodules were, for the most part, enclosed within relatively thick-walled sinuses from the endothelial lining of which they took origin. Each was composed of an intricate network of delicate capillary channels filled with blood, and grew so luxuriantly as in many instances to fill the lumen of the sinus. Frequent hæmorrhages and occasional thrombosis resulted. The intervening tissue was mainly a loose, somewhat cellular, and very vascular connective tissue; but in places it appeared older and more fibrous, with large thick-walled vessels coursing through it. Some of the angiomatous nodules projected slightly beyond the general surface of the mucous membrane, and where this occurred the epithelial covering had disappeared. The overlying epithelium was not therefore continuous but appeared at intervals along the circumference of the section, being abundant in the small depressions between the projecting nodules, but absent from their surface. It was composed chiefly of a transitional type of cell, elongated, tailed, and where most abundant, in several layers. At some places only a few scattered tailed cells could be seen adhering to the surface, while at other parts of the circumference there were traces of squamous epithelium visible.

The causes, detailed by writers on the subject, accounting for such conditions have been ascribed to a sudden fall causing prolapse of the mucous membrane, or a large caruncle dragging on the mucous membrane and causing gradual eversion. Or again, and not at all unlikely in the foregoing case, the constant straining undergone by the patient at stool and a degree of vesical tenesmus, combined with a relaxed state of the mucous membrane due to the general debility of the patient, may have favored, if not altogether caused the condition. Such conditions as cystitis and the presence of a calculus producing more or less continual tenesmus have been known to cause the condition.

Kleinwächter has described two varieties of prolapse of the urethra, one in which the mucosa near the meatus is everted, the other in which it becomes loosened higher up, gradually extending down until it appears at the meatus urinarius.

As regards the progress of such cases, we may have various changes taking place. At first presenting inflammatory changes, they may remain in this state or may at any time become ulcerative or even gangrenous. In some old-standing cases the prolapsed mucous membrane has taken on a skin-like character.

Looking at the symptoms of such a condition, we find them varying to a greater or less extent. In some, no discomfort has been caused, while in others we find the same symptoms present as those characteristic of the caruncle. The prolapse may give rise to or increase already existing vesical tenesmus; and the possibility of cystitis occurring must not be forgotten.

Treatment should first of all be directed to the relief of any causal condition, as cystitis or caculus. One may try to relieve the inflammation of the protruding mucous membrane by the local application of hot water and rest in bed, when simple reduction by manipulation or aid of a sound may be attempted, followed by the use of astringent injections, with a view to promoting contraction of the uretheral canal. This may succeed in cases where there is but slight eversion present, but as a rule some form of operative interference will require to be carried out, as in the case described.

A STUDY OF THE CONDITIONS THAT REQUIRE THE REMOVAL OF THE CHILD FROM THE BREAST[1]

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Part I

THE removal of the nursing babe from the breast may be required for any one of a great variety of conditions which affect the mother or the child, or both.

It may be demanded as a consequence of changes in the milk itself through chemical action, or through the presence in the milk of foreign substances which have been taken in by the mother, or which occur as the result of changes in environment, or changes due to local or systemic disease, or from anatomical variations in either mother or child. In consideration of these many possibilities, it has seemed simpler to take up the subject by an examination of the literature, first in regard to the presence in the milk of drugs administered to the mother, and to follow this with a review of some of the conditions where local or systemic disease demands the removal of the child.

The question of food for the mother during lactation has been the subject of much speculation, and has received more attention, I believe, than it really deserves, for if it is possible to show that drugs and alkaloids when given to a mother rarely affect the milk injuriously, and almost never the babe to a marked degree, it will hardly be maintained that such dilute chemicals as may be found in fruits and vegetables can go over in the milk and affect the child.

The transmission of medical substances through the milk of the mother to the babe is a subject of more than usual interest and more than usual obscurity. Many cases have been reported with the object of putting the phenomenon on a real scientific basis, but owing to the prevalence of tradition and the absence of thorough and accurate methods in collecting the data, the observations are for the most part quite valueless. Furthermore, the reports not only rarely agree, but frequently are so directly contradictory that positive, or even probable, conclusions from analysis are almost impossible.

Under these circumstances, it becomes necessary to pick out the work of a few of the most reliable observers, such as Sonnenberg, Thiemich and others, and therefrom to attempt to formulate a more or less secure working hypothesis.

It is frequently desirable to medicate the mother, without including the child, either for general or local conditions and occasionally to increase or diminish the maternal milk, and it is desirable to know whether this can be done without injuriously affecting the babe.

Another question, at present more or less academic, arises in regard to the possibility as well as the value of administering drugs to the babe by means of the maternal milk. The field is large and interesting; experiments have been few and far from satisfactory.

In making deductions from the evidence, it is always necessary to take into consideration the idiosyncrasy of the patient and to avoid making too sweeping generalizations. One of the most commonly used drugs, and one which for that reason *ought* to furnish a large mass of evidence, is alcohol. Here we have a substance in very general use among all classes of society for its supposed effect in strengthening the mother or babe and increasing the quantity of milk, and yet how few and unreliable are the published reports. Sonnenberg is quite convinced that it passes over in the milk and poisons the child, and describes the resulting nervous symptoms. Thus, a child of some months becomes irritable without apparent cause, fretful, and sleepless; the breast quiets the child only for a time; the period of irritation is followed by a state of deep, almost comatose, sleep, during which the face is occasionally distorted. A free interval may follow, and then a renewed attack, which is co-ordinate in time with maternal excesses. The parents

[1] Read before the Cate[illegible]

blame the teeth, the doctor thinks of meningitis, but many times the condition can be traced to alcoholic excess.

Rouvier reports a pertinent and somewhat corroborative case, in which a wet-nurse took an excess of alcohol; after she recovered from her drunkenness, the nursling, until then thriving and well-conditioned, became irritable, had very prominent red eyes and florid scalp, dry tongue, and all the signs of cerebral congestion, which only diminished after nine days of antiphlogistic treatment. Nothing, however, is said about temperature, bowels, or other possible abnormalities.

Cases have also been reported by Anarion, de Vernay, Meunier, Charpentier, Perier, etc., that are equally inconclusive. Apparently, only two men have investigated the subject with scientific accuracy.

Lewald made many experiments, but could not demonstrate alcohol nor any of its products in the milk.

Klingman used 100 c.c. of alcohol at a dose, and none went over that could be chemically detected. When he used 200 c.c. the animal was overwhelmed, the quantity of milk markedly diminished, but 35 c.c. went over. This latter experiment must be excluded, of course, because the animal was poisoned.

It is therefore, safe to assume, on the basis of this methodical observation, that in general, so far as animal experimentation shows, either very little or none goes over in the milk. That this must be more in accord with our practical experience is shown by the scarcity of published cases in the literature. That in some instances there will be variations from the general law must not only be regarded as possible, but highly probable, and cases should be sought for. Thus Ribemont and Dessaigne et Le Page show that chronic intoxication has a very injurious effect on the nursling, and this they trace to alcohol in the milk, though their method is not unexceptional.

Opium and its derivatives. This drug is highly important, since many cases have been reported where a nursling has met death through the oral administration of a very small quantity. There are authentic cases of infantile death in which a child under five years received only 0.025 grams. Fehling states that a nursing woman can take 0.01 to 0.02 grams of morphine sulphate hypodermically without injury, and that laudanum, moreover, can be given without hesitation, either by mouth or by rectum. Tornhill, after the use of 25 gtts. of tincture opii, finds neither constipation nor sleepiness in the child. Pinzani reports three cases where the mothers took therapeutic doses without effect on either of three children. Cirenville reports a case where the mother took a large dose of morphine sulphate for neuralgia; the next day the child lost appetite, became cyanotic and convulsive, with dilated pupils, and this he attributes to the morphia. It is hard to see how he can make such a deduction from symptoms so contrary to the physiological effect of the drug, unless he can also show that the change in effect is due to some alteration produced by its passage through the body of the mother. Fubini and Cantu report a case that more nearly supports the thesis.

A nurse put a pledget soaked in laudanum into a tooth cavity, and an hour afterward a three months' old child was given the breast. The child became sleepy, lids closed, myosis, prolonged heart and lung motions, and no reaction to irritation. Coffee was given by mouth and rectum, and child recovered in about an hour.

In the experiments inspired by this case, Fudini and Cantu gave 0.02 grams of morphia muriate hypodermically to each of four dogs that had recently whelped. The quantity of milk which they could secure diminished in a few days from 40 to 50 c.c. to 2. c.c. daily, but chemical proof of morphine was never found in the milk. Morphia, however, given to a lactating goat did appear in the milk.

None of the cases can be regarded as free from doubtful conditions and objections. Houselot, on a basis of well-observed cases, considers the question still unsettled, and recommends great care in the use of the drug, and that much less than Fehling permits should be employed.

Atropine, or *belladonna*, is another drug that is used quite frequently in practice as a means or restricting mammary secretions. It is, therefore, a matter of some importance to determine whether or not it passes over to the child, as Sonnenberg claims. Fehling gave

enough to dilate the pupils of the mother, but could get no positive result from the nursling. Fubini and Bonnani, however, in a series of 15 experiments, got positive results which would seem to establish definitely the transmission in the milk of enough atropine to affect the vagus.

Now, Rummo has shown that only 0.00025 grams of atropine is required to affect the vagus, so that Fehling's observation is still valuable in showing that the physiological dose is probably harmless. The statements concerning atropine may be considered as applying to hyoscyamus and its derivatives as well.

It may also be mentioned here that the use of atropine or its congeners as a means of drying up the milk should be dispensed with altogether, since it has been well demonstrated by Storrs that, even if it had such an effect, it is wholly unnecessary, since excellent results follow expectant treatment.

Chloral hydrate. Thiemich denies that chloral hydrate is transmitted to the child, but other writers maintain that it *is* eliminated by the milk, and may exercise a bad influence upon the nursling. Sonnenberg states that the use of 1.5 grams twice daily will produce no symptoms in the babe, unless the breast is given within three-quarters of an hour after the dose is taken, in which case restlessness and prolonged sleep will be noticed.

According to Fehling, chloral should not be prescribed to a nursing mother.

Chloroform. Scanzoni reports a case where for severe after-pains $ChCl_3$ was used for five to six minutes, and the child put to breast three hours later. Being a powerful child, he nursed eagerly, but after a few suctions he dropped the nipple and fell into a deep sleep for eight hours, out of which shaking would not arouse him. He was noticeably restless thereafter for two days.

On this one observation Scanzoni advises against the use of $ChCl_3$ in a nursing mother. No exact chemical proof is at hand.

Ether. Besides the old observation of Goropp Besanse, in which he claims to have distilled ether out of the milk after an ether narcosis, we have the case of Godey. The mother was etherized during labor, and for three days the new-born babe refused the breast. When he finally took it, he vomited all the milk he had taken, and he did this repeatedly, although when put to the breast of another woman he seemed quite content. The two reports are, of course, quite valueless, although interesting.

Quinine is another very interesting drug which is commonly used. Lewin makes the positive statement that the possibility of seriously injuring the nursling through the transmission of quinine in the milk of the mother is proved by experience. He says that the excretion of quinine through the mammary glands has been definitely and correctly determined, but he does not give the methods employed. It is recommended to draw the milk from the breast three hours after the administration of the drug, that the babe may not receive the milk that is richest in quinine.

Transmission of quinine is not accepted by Thiemich without further proof; in fact, he does not regard the reports as in any way plausible. On the contrary, Burdel and Oui admit the possibility, but the former finds it occurs very irregularly. He (Burdel) says that it occurs most rapidly when the stomach is empty, and may become very dangerous to the child, but if used at mealtime, very little goes over in the milk; and the greater the age,the less sensitive the child. Thus, babes of six months or more have little to fear. If one uses quinine in a recently delivered case, it should be employed in conjunction with food.

Salicylic Acid. Pauli first put this drug on a basis free from exception, not alone for the acid, but for its sodium salt. In the use of free acid he constantly obtained positive results, and in a series of 12 observations only once failed. The amount employed rose to 12 grams daily, and the excretion always began within two hours, and ceased soon — only once so late as twenty hours.

The quantitative estimation of the amount excreted, according to the colorimetric method, indicated that the concentration of salicylic acid in the milk did not exceed 0.005 to 0.01 per cent, so that a toxic or even a medicinal dose for the nursling is not to be feared.

Pauli's observation was confirmed by Fehling who got a reaction from the child's urine, and by Stumpf, who used a goat in his experiments.

Potassium and Sodium Bromide were used by Rosenhaupt in an epileptic woman, and he was able to demonstrate chemically that the bromine passed over in the milk. This is not dangerous, however, nor especially to be avoided, since only an infinitesimal amount passes over. The reports of Loughlin, Löwy, and others are also confirmatory.

Antipyrine was found by Pinzani in the milk of seven women, and in the urine of nineteen babes whose nurses were taking the drug in therapeutic doses (Sweisinger method employed). In one litre of milk there was 0.05 grams of the drug when 4 grams had been given within sixteen hours. Quantity and quality of the milk was not affected. Lewin, on the contrary, believes that the quantity of the milk is diminished by the use of the drug, and for this reason should be employed with caution.

Fieux confirms Pinzani's observations, and concludes:

1. Antipyrine certainly passes over in the milk in a natural state.

2. Two capsules of 1 gram each, given at intervals of two hours, may be detected in the milk in from five to eight hours, and in from nineteen to twenty-three hours afterward it cannot be discovered; elimination lasts about eighteen hours.

3. Antipyrine during this time passes into the milk only in excessively small proportions — less than 50 parts in 1,000, and it is only under exceptional circumstances (60 grs. in 16 hours) that it perceptibly reaches this proportion.

4. It does not in any way affect the quality of the milk, lactose, caseine, or fat.

5. It does not affect the quantity of the secretion.

6. The infinitesimal quantity absorbed by the nursling does not seem to have any unfavorable action.

Phenacetine. Lewin states that it is excreted through the urine, not as unchanged phenacetine, but as phenetidin. Acetphenetidin goes over in the milk, and also the derivatives of the same, which is important from a therapeutic standpoint.

Mercury. This is a very important drug because of the frequent indications for its use. According to the older investigators (Peligot, Chevallier, Henry, and Harmer), it was not possible to demonstrate the presence of mercury in the milk of their control animals.

Schaünstein and Späth were unable to get a reaction after four days of inunctions.

Lewald was the first to demonstrate mercury in the milk of the goat, but only after he had given large doses of calomel (4 grams per day), and produced ptyalism and almost a cessation of the milk.

Sigelas found that mercury was eliminated by the milk, but only after a number of days.

Jegourel reports confirmatory observations.

Time for elimination depends on the preparation, the dose, the animal, and the age. The delay in its appearance doubtless explains the failures of many of the older observers. The absorptive power of the leucocytes and other cells may also help to explain the delayed appearance.

v. Klink and others have healed syphilitic nurslings through treatment of the mother, a method which the experiments of Sigelas have now shown to be on a sound basis, although the direct treatment is more rapid and certain, and should on this account be preferred.

Iodine and its derivatives stand in close relation to mercury. It is very readily excreted by the milk. The tincture is excreted within twenty-eight hours after its use. Lewald finds sodium iodine in the milk four hours after a daily dose of 2.5 grams is used. Fehling used a daily dose of potassium iodide, 0.15 grams, but found no influence on the child, but in larger doses it quickly appears in the urine and fæces.

In Lazanski's case a nursing woman took 0.5 grams of KI, and the reaction appeared in the urine the same day, in the urine of the nursling the next day.

Koplick demonstrated a potassium exanthem upon a child nursing a mother who was taking potassium iodide.

Lewi saw pronounced symptoms of iodinization in a nursling whose mother took KI.

The uncertainly of the quantity transmitted, is an objection, and a serious one, to the use of potassium iodide as a therapy for luetic nurslings through the mother's milk.

Whether the potassium iodide leads to the rapid drying up of the milk, as Stumpf and

others claim, is not certain, but this is not an important usage, as we had occasion to remark when speaking of atropine. It is entirely unnecessary and should be absolutely abandoned.

Iodoform, even when used in very small doses, or as a dressing on wounds of vulva and vagina, will go over into the milk. The quantity excreted is quite variable and stands in no certain relation to the dose employed.

Arsenic. Brouardel and Pouchet used 12 gtts. of Fowler's solution in a nursing woman, and with gradually increasing doses could always demonstrate the drug in the milk. In one case where the patient took 12 gtts. of Fowler's solution for six days, there was 0.001 grams as in 100 grams milk.

Since 0.15 grams As. may kill an adult of 70 kg. weight, a fatal dose for a child of 3 to 4 kg. weight might be 0.006 or 0.0085 grams.

Jegourel also gives confirmatory experiments.

Therefore, arsenic ought to be used with great caution where a mother nurses her babe.

Iron. Thiemich says that it is yet undemonstrated whether or not the iron constituents of the milk are affected by the administration of this drug to the nursing mother. With an abnormally low hæmaglobin of blood under pathological conditions, there has been no investigation of the change that might occur under the use of iron. Some authors maintain that the quantity of milk is increased by iron, and Bristow claim that it improves the condition of anæmic children to give iron to the mother, and this is easily probable through the improved quantity and quality of the milk.

Lead, Zinc, Copper, and Bismuth, have received some attention, and it seems probable that both copper and bismuth pass over in insignificant quantities. Deneufenburg has established the transmission of lead in the milk. Bouquet quotes an interesting case where a woman worked in lead constantly during sixteen lactation periods, and each of the babies died in convulsions during these periods, except the last. With this child health began to fail until babe was removed from breast, whereupon recovery ensued.

Thyroid Substance has been investigated by Mossé, Cathala, Toulouse, and Cadet de Gassicourt. In one case, a three months' child with goiter nursed a goitrous mother, and the mother was given thyroid tablets corresponding to 1.5 grams of fresh gland daily. After one and a half months' treatment a slight reduction occurred in the size of the maternal goiter and a marked improvement in that of the babe. Four months from the beginning of treatment the child's goiter had disappeared entirely.

A second case has been reported from Christiana, by Ivar Bang, which shows an interesting difference: The mother took iodothyrin for three weeks, 0.3 mg. to 0.7 mg. daily. Within twenty-one days there occurred, at first rapidly, and later more slowly, a reduction quite marked in the maternal goiter, and still more pronounced in that of the child, which was two months old when treatment was begun. Diminution showed earlier and to the greatest degree in the child. The use of a minimal quantity in the early days brought about a strongly marked effect and suggests the possibility of an accidental condition as a factor in place of the iodothyrin. Experience does not as yet allow us to state whether such a diminution in a goiter could occur spontaneously.

Acids. Landerer has found that acetic acid passes over in the milk, and this may be the basis for the long current belief that nursing women should not eat acidulous fruits. While we know the stomach normally contains a large amount of hydrochloric acid, which apparently never affects the milk, it does not seem probable that the small amount that could be ingested with an acid fruit could injuriously affect the milk. The writer has continuously given every variety of fruit to nursing women without effect upon the milk. Nevertheless, the possibility of an idiosyncrasy must be kept ever in mind.

Evacuants are the subject of much discussion and many diverse opinions: Thus, Cazeaux claims that rhubarb passes over in the milk, and Schaünstein and Späth definitely maintain a contrary opinion. Most observers agree that senna goes over to the child and produces colic, as well as laxative conditions, and in addition gives its characteristic odor to the milk.

Dolan states that castor oil lends a characteristic odor and taste to the milk, and produces colic in the nursling.

Balsam of Copaiba passes over in the milk, according to Lewin; and pilocarpine, through its effect upon the skin, transiently diminishes the quantity of the milk, although not as yet demonstrated chemically.

Cascara, *Aloes*, and some other common drugs seem to have furnished no literature as yet with reference to lactation.

This completes the survey so far as it pertains to relatively common drugs. This investigation has been a source of considerable surprise, and of great interest and information to the writer. The scarcity of clinical reports in the literature has been no less surprising than the almost valueless character of those found. As a result, it seems probable that alcohol, opium, chloroform, ether, thyroid extract, and lead should be used with extreme care in a nursing woman until their status is determined; that zinc apparently has no effect, while all the others investigated, namely, atropine, arsenic, antipyrine, acetic acid, bismuth, brom. potassium, balsam of copaiba, castor oil, copper, chloral, iodine and its compounds, mercury, phenacetine, quinine, salicylic acid, and senna, pass over in small quantities, but very rarely to a degree injurious to a sensitive babe. Hence, it is practically never necessary to remove the child from the breast on account of drugs administered to the mother. That this position is correct is substantiated by the fact that cases occur so rarely in the literature. A logical inference from the above data may also be drawn that, owing to the total absence of transmission, or owing to the impossibility of satisfactorily measuring the amount transmitted, it is never desirable to attempt to medicate the child by means of drugs administered to the mother.

Part II

There are quite a number of anatomic and physiologic as well as social conditions that prevent the nursing of the babe. Before taking up the various organic and functional diseases which may interfere with the mammary function, it is necessary to refer briefly to a few anatomic peculiarities which quite definitely and obviously exclude the child from the breast. For instance, we may mention inverted nipple, a relatively common maternal anomaly, while, on the part of the child, one may find a facial paralysis due to forceps, or to the difficult passage of the inlet in a case of contracted pelvis. Here, too, must be considered the hare-lip, which requires artificial nourishment, since suction is impossible with a labio-palatine fissure.

The condition widely known as "tongue tie" was for years thought to interfere so positively with nursing that the division of the frenum was quite common, but we now know that interference with nursing from such a cause is not possible. It was Petit, I believe, who first showed that the division of the frenum was useless and sometimes dangerous, while Escherich has demonstrated that in the act of nursing the babe does not draw back the tongue, but compresses it between the nipple and the inferior maxillary bone.

Some of the more evident conditions that require the removal of the child from the breast are to be found in the nipple, as a direct consequence of the nursing process. The child's mouth under such circumstances is by no means harmless, since it furnishes a continual rubbing, grinding, and pulling effect by the action of the gums and tongue; a softening or maceration by means of the saliva and milk; and supplies with the saliva multiple forms of infective agents to supplement those already present upon or about the nipple. On account of the germ contents, the saliva itself is always pyogenic when injected under the skin, and easily produces an abscess.

Owing to the mechanical effect produced by the babe's mouth, therefore, in nursing, injuries occur varying from the blister, excoriation, erosion, fissure, and deep crack of the nipple proper, to the semicircular and circumscribing break in the tissues at the junction of the nipple with the breast beneath.

The occurrence and character of an injury depend upon many things. More occur upon badly formed nipples than upon the well-formed, as one would reasonably expect. Thus, conical nipples are injured in 56 per cent of the cases, while the cylindrical shape furnishes only 47 per cent. Then, too, the more powerful the child, the greater the liability of injury. Primiparæ are affected oftener (56 per cent), as compared with multiparæ (47 per cent), in

whom the nipple has been worked into shape by previous nursing and the wrinkles in the nipple skin either stretched out or obliterated. These wrinkles in the nipple are important because they are the invariable starting-point of fissures. The skin is much thinner and more tender at the fold, and being less adapted to resist mechanical insult, it cracks in the act of nursing, the crack always corresponding to the course of the fold. On the whole, Platzner's statement must be accepted that nearly one-half of all nipples show wounds or breaks of some kind. These injuries in turn are all openings through which infection may enter the breast and cause serious disturbances, but even in the beginning when very painful, or if the patient is particularly sensitive or nervous, the removal of the child may be required.

Usually, by means of local applications or the interposition of the rubber nipple-shield for a few days, these disorders, which rarely occur after the first ten days, can be readily cured. If not, the babe must be taken away and the nipple put at rest until relief is secured. If not cured quickly, danger to the breast threatens, infection may take place and extend into the deeper portions of the gland. The condition would then be more serious and the child would have to be removed on account of the general glandular involvement. Whether the infection is parenchymatous, acinous, or subglandular, the breast must be put at rest by the removal of the babe, and appropriate measures undertaken. The formation of an abscess is quite probable; and both the breast and the child are better for the separation. In some instances, when the duct has carried the infection to the deeper convolutions and pus forms, the child may nurse almost pure pus for days before the discovery is made. It is apparent that inflammation of the ducts is most frequent among women who have but little milk, since babes must nurse so often and so long that they thereby produce excoriations, which subsequently become infected.

Winckler and Koehler estimate that six per cent of lying-in women are thus affected. Theoretically, this infection may occur in three ways, either by the blood, the lymphatics, or the lacteal ducts.

It has been demonstrated that the micro-organisms of mumps (if such there be), of typhoid, and of puerperal fever may by metastasis produce mammary abscess — the germs being transported in the blood. Escherich has also shown by animal experiments that microorganisms in the blood can be eliminated from the breasts by means of the milk, as they are from the kidneys by means of the urine. This will be referred to again when systemic diseases are considered. Infection by the lymphatics is extremely rare, and even denied by competent authorities.

Contrary to what one observes in ordinary lymphangitis, the ganglia of the axillæ often remain untouched in glandular infections and inflammation of the breasts. The propagation of the infection takes an inverse direction to the course of the lymph which is absolutely contrary to the usual march of a lymphangitis. Besides, the infection is often localized clearly in one lobe of the gland; and how can one explain this phenomenon if one admits infection by the lymphatics, since the mammary lymphatics quite freely intercommunicate?

Where the infection enters the connective tissue, it may well spread through the lymph channels. Infection by the lacteal ducts, on the contrary, explains quite easily the lobar form of infection and the succession of many isolated abscesses, since each lobe of the gland opens by a duct at the summit of the breast.

Chassaignac, Budin, Arbel, and others have furnished irrefutable proof of the possibility of localization of the inflammation in the ducts. It has been observed by many that when the gland is pressed, pus and milk may run from the same opening. It has been demonstrated conclusively that congestion or mammary engorgement will not *per se* produce inflammation.

Delbet, by experiments on animals, and Williams and Storrs, from observations on a series of 175 cases at Johns Hopkins Hospital, have shown conclusively that milk stasis in the absence of infection is a very innocent condition.

It is quite obvious that the ingestion of pus by the nursling is a serious matter, but just how serious will be better understood by a short review of the disturbances traced to this cause in the various published reports. Thus

we may have a diphtheroid stomatitis; retropharyngeal abscess; gastrointestinal dyspepsia, light and without fever; toxic infectious dyspepsia, light or grave; cholera infantum; multiple subcutaneous deep abscesses, following intestinal intoxication and digestive trouble, with fatal result, as happened in a case seen by the writer.

Otitis media may occur by propagation through the Eustachian tubes, and finally the toxins may be absorbed without intestinal disorder, and produce a genuine septicæmia. By external contact the same pus may produce in the babe submaxillary abscess; multiple superficial subcutaneous abscesses; catarrhal and purulent conjunctivitis or ecthyma, either by direct cutaneous contact or by skin elimination after the intoxication following digestive trouble. Also may be mentioned thrush and bronchopneumonia, which may develop sequential to the gastrointestinal disturbance. Other local conditions, such as scirrhus and Paget's disease of the nipple, the latter not only for itself, but because of its constant association with scirrhus, should exclude the child from the breast.

Primary tuberculosis of the breast, as shown by Davis and others, prohibits absolutely the nursing of the babe, since it is completely demonstrated, by cases and by experiments to which we shall refer later, that the bacilli go over in the milk. The anomalies of the milk constitute a large percentage of the cases that demand the removal of the child. Aside from very evident conditions, such as insufficient quantity and another condition somewhat harder to diagnose — deficiency in quality — there are many things that will affect the milk and render it unfit for, or even fatal, to the child.

Anæmia in any form may demand the removal of the child, not alone because the condition of the blood results in an inadequate supply and a deficient quality of the milk for the babe, but also because the mother needs all her strength and power of recuperation.

Great loss of blood during labor is not *per se* a reason for removing the child, but if the woman does not quickly rally, or if she is exsanguinated, there should be no hesitation.

Saunders reports five cases in which he showed that the milk was toxic from the presence of the menstrual flow in one case, and from undetermined causes in the rest, and that its ingestion produced frequent, watery, acrid, and green stools with much colic.

According to several authorities, the *return of the periods* after delivery exercises *at times* an incontestable influence over the lacteal secretion, and therefore upon the nursling. This is a subject of great and general interest.

Tarnier states that when the periods return during lactation, it sometimes happens that the milk is diminished in quantity, or even disappears entirely for a day or so, only to return as quietly as it disappeared; at the same time, the proportion of solids increases to a notable degree, especially the butter casein and salts, while the sugar diminishes. These modifications are especially apparent while the flow is on, but may be observed many times in less degree during the intervals. Often during the flow the child digests less perfectly, cries more, becomes slightly pale and somewhat weakly. For Tarnier, therefore, the return of the periods is an unfortunate event in the course of lactation, but he does not on that account require the child to be fed artificially.

Budin also finds that when the flow returns during lactation there is a loss of weight in about one-half the cases, diarrhœal conditions, vomiting, erythema of the breech, etc. The importance of this will be recognized when it is stated that nearly half (41 per cent, Roche; 43 per cent, Du Boissard; 58.7 per cent, Heil) the women have a return of the flow during lactation. It simply means that the child should be carefully watched (weighed), and if in certain cases one notes green diarrhœa, irritating to the skin, and a diminution of weight at the menstrual epoch, a change should be considered, but not if the child continues to gain.

The sequential injury is far more likely to fall upon the mother, owing to the additional drain upon the system, and it might be necessary on *her* account to remove the child.

New pregnancies sometimes occur during lactation, and it is generally recognized that ovulation continues whether the menses return or not; hence a voluntary prolongation of lactation to avoid conception is futile. It may be added, however, that the more regular the

periods, the more liable is the woman to conceive.

Poirier has observed the effect in a number of cases where conception occurred during lactation. In 80 per cent, no perceptible harm was produced upon the babe, but in 20 per cent, immediate withdrawal from the breast was required. The pathological conditions that demanded the removal, were not found, although possibly reported. This, then, is another case for watchful expectancy and the removal of the babe, if reasons therefor should arise. One should also keep in mind the possibility that the mother may not be able, especially in large cities, to sustain simultaneously a lactation and a new pregnancy. Examination of the milk at four and one-half months (Budin) shows no abnormality, but if it diminishes in quantity, of course supplementary nourishment should be given.

There is another series of cases where quantity or quality of the milk is interfered with by the occurrence of certain emotions, such as *fright, anxiety*, or even *excessive joy*. A woman in Tarnier's clinic, greatly frightened by a burn, lost a large part of her milk, and the child had vomiting and diarrhœa, which did not cease for three or four days.

Vomiting, diarrhœa, loss of weight, and sometimes erythyma, are the characteristic symptoms under such conditions.

Long-continued domestic disturbance or anxiety may produce the same result.

A wet-nurse may become homesick, and in consequence the milk dries up. Very sensitive women during lactation may become so wrought and nervous that the composition of the milk is injuriously modified and the health of the babe affected. This has been ingeniously explained by Spolverini, who found an oxidizing agent constantly present in the milk of normal women; and under the influence of profound emotion, great danger, or extreme grief, the conditions favorable to its activity are provided. When the milk is examined microscopically after such nerve-storms, there is found an unusual number of colostrum corpuscles and leucocytes. The deduction is, that for certain reasons, the milk tends to return to the colostral state. The oxidizing ferment is always present, and when its activity begins, colostrum is the result; and knowing that colostrum is ordinarily a laxative, it is not difficult to see that in large quantities it may produce many and varied disorders in a child. If the Czerny theory is correct that the colostrum corpuscles *are* leucocytes, then the field for speculation and investigation is greatly broadened.

The Spolverini theory, however, does not satisfy all the conditions, nor throw much light on the nervous and convulsive disorders, nor on the meningeal phenomena. It is recognized to-day from the work of Gauthier that alkaloids, analogous to ptomaines, may be produced in living organisms by the malassimilation of albuminoids. Anger, or any violent emotion, aids this malassimilation and surcharges the organism with injurious products, which may pass into the milk and provoke a true toxæmia in the nursling — an eclampsia analogous to that of pregnancy. When the emotional disturbance occurs but once in a woman, the child may be left at the breast, but when the condition is a habit, or occurs frequently, the child should be removed. In cases of mania and epilepsy, it may be unsafe to leave the child with the mother; and while it is rare for an epileptic attack to occur without enough warning to enable the mother to put the child in a safe place, it is better to feed such a babe artificially.

Albuminuria has been the subject of a great number of discussions from the standpoint of the babe and the mother. Gamulin and Jockewitch, between the years 1896 and 1899, collected over 200 cases of albuminuria in women who nursed their babes, and in all these cases the babes left the hospital in good condition and gaining. Dumas believed that lactation was not materially influenced. In general, then, it may be said that albuminuria persisting after delivery is not incompatible with giving the child the breast, from the babe's standpoint; but it is certain that an albuminuria sufficiently prolonged to affect the maternal health seriously should, on that account if no other, require the removal of the child. There are certain cases, besides, where the mother has a grave nephritis, with œdema and uræmic symptoms, that the milk is presumably charged with toxins and does not have good nourishing

qualities, and in these cases the nursing of the child should be forbidden, in its own behalf.

Osteomalacia, a disease accompanied, if not caused by, malnutrition, imperatively prohibits the child from nursing, on account of the mother.

Cardiac lesions. Demelin states that the "nature of the affection matters less than its degree of gravity and its effect upon the general health." Thus, no one would advise the nursing of a babe when the mother has an asystolic lesion; while, on the contrary, many women with pure mitral regurgitation may and do nurse their babes without injury. All depends on the state of the general health and the manner in which the heart bears the strain during pregnancy and labor. If in the course of the pregnancy there has been no marked functional inconvenience, no persistent albuminuria, no hæmorrhages of various kinds; if, during labor, no pronounced arryhthmia has occurred, nor serious hæmorrhages, the woman may nurse her babe under careful medical supervision. If, on the contrary, the cardiac lesion is not well compensated, lactation ought to be discontinued as a source of fatigue and prostration. It is not desirable, at the present time, to go deeper into the relationship between lactation and various organic and functional diseases. The interesting group of bacterial conditions demands attention.

Before taking up the various local and systemic infections, it will be well to review some of of the pathological developments of the last decade. For many years it was maintained that the microorganisms could not pass over in the milk, and even at the present time there is much ignorance on this subject. It is very important to this paper to determine whether or not germs do go over in the milk, and what effect, if any, such a transmission could produce.

From the freedom and ease with which the bacillus coli traverses the tissues and migrates in the body from one organ or cavity to another, one would expect to find this germ present occasionally in the breast milk, but I have been unable to find such a case in the literature.

Longard found staphylococci in the milk of febrile puerperæ, with which he inoculated lactating women, and in a few hours found the germ in the breast milk.

Michael and Merritt have worked along the same lines with positive results.

In his researches upon animals and upon women having puerperal fever, Rossi Doria concluded that the germs passed intact through the mammary filter, and in great part were eliminated by the lacteal secretion.

Karlinski's experiments are quite to the point: A woman had puerperal fever and an erysipelas. On the fourth day of the febrile state, before any sign of the erysipelas had appeared, five c.c. of milk was drawn from the left breast, under antiseptic precautions. The examinations revealed the presence of staphylococcus pyogenes (aureus, albus, and citreus), staphylococcus cereus (albus and flavus). The child was removed from the breast, and on the fourth day exhibited a parotiditis and catarrh of the intestines, which ended fatally on the tenth day. In the blood and the intestinal contents were found the same organisms as in the maternal milk

After this clinical observation, Karlinski undertook a series of experiments to establish, if possible, whether among animals subjected to inoculation of staphylococcus pyogenes, one would find these in the milk, and if the progeny would be infected by such milk.

Without quoting the experiments in full, it may be stated that not only were the germs found in the maternal milk twenty-four hours after the inoculation and for eight days thereafter, but the young nursing rabbits that died on the sixth, eighth, and tenth days revealed the germ throughout the alimentary canal and in the spleen. One also exhibited abscesses of the mouth and spleen, in which the germ was found.

These experiments were repeated many times, and Karlinski concludes: That the passage of pyogenic microorganisms from the blood into the milk ducts is possible; that the passage occurs in a relatively short time; that the microorganisms that appear in the uterus during the involution may also appear in the milk; that animals nursed by infected mothers die in relatively large numbers from pyosepticæmia.

It is most curious, in this connection, to find that the milk of sound women also contains many pyogenic bacteria (staphylococcus albus).

Cohn and Newmann found microorganisms in 38 out of 41 cases, most often the staphylococcus albus, which seemed to abound in the peripheral portions of the lacteal ducts; and the authors show that they came from without; that they do not alter the milk; that they are not injurious to the nursling; and that they do not produce any inflammation in the mammary gland.

Honigman found only four out of 76 normal women examined whose milk was sterile.

Falske and Köstlein give similar reports.

It seems probable that these germs become actively injurious only in the presence of a break in the mucous ramparts, so far as concerns the mother; but the milk containing these germs cannot be inoffensive to the nursling, though the morbid effects may be variable. This variability in virulence would depend upon special causes which might modify its action, or paralyze it absolutely. Mixed infections may also occur and make the picture atypical.

Perret reports a series of cases of infection, including tonsillitis, pelvic infections, sapræmias, lymphangitis, and icterus, wherein the nursling remained at the breast, and from which he concludes that this method might be followed possibly in a majority of the cases.

In the light of various experiments on animals and knowledge acquired from other sources, this would seem to be extremely hazardous. The infectious and contagious diseases, such as typhoid, all the eruptive fevers, erysipelas, acute pulmonary affections (like pleurisy and pneumonia), and acute articular rheumatism, are direct and positive contraindications to nursing the babe — dangerous to the mother on account of exhaustion, and dangerous for the child on account of the possibility of germ transmission through the milk, and because the milk is altered in character and loaded with toxic material.

Brieger and Ehrlich particularly have shown the great facility with which diphtheria toxins may pass over in the milk.

Tuberculosis is probably the most important, because one of the most common, of the contraindications. Systemic tuberculosis exhausts the mother, makes the milk deficient in quantity and quality, and loads it with toxins. Moreover, the close contact of mother and child will almost invariably infect the child without the intervention of the milk. The same is true of old pleurisies that may possibly be tubercular. Where the woman has had a coxalgia, but has been cured for many years, and is in sound health, the babe may nurse.

Furthermore, the question of the transmission of the germs through the milk has been definitely settled, not only by the demonstration of the passage of staphylococci, but by the transmission of the bacillus tuberculosis itself.

Hippolyte Martin has shown that tubercular milk will infect an inoculated animal.

Koubossoff has shown that animals inoculated with tubercular pus will exhibit the bacillus in the milk in about two weeks.

Despite Koch's statement, it is well known that tubercular cattle will produce tuberculosis through the milk. Nonewitsch (quoted by Cornet) reports 3 cases where the bacillus of tuberculosis was carried over in the milk, and in one of these cases the woman presented only very slight evidence of pulmonary infection.

Roger and Garnier report a woman, with pharyngeal and pulmonary tuberculosis, who died seventeen days after labor. The bacillus was established in the milk without clinical evidence of tubercular lesions in the mammary gland. The milk, aseptically obtained, was injected under the skin of a rabbit, which died thirty-three days later with typical lesions of general tuberculosis. The child, nursed by the mother for two days only, died six months after birth. The post-mortem shows granulations in mesentery, liver, spleen, and kidney. The localization of the lesions showed that the bacilli were absorbed through the alimentary canal.

A question at once arises in regard to the defensive power of the gastric juices; and, fortunately, observations are reported which bear on this subject.

The experiments of Chauvean, Weiser, Bollinger, Hirshberger, Falk, Baumgartner, and others, go to show that the digestive juices have not sufficient power to interfere and protect the system.

Strauss and Wurtz made experiments with pure culture of tubercle bacilli and pure digestive juices, and were enabled to infect animals with the mixture after exposure to the digestive

action for six hours — a much longer time than the bacilli ordinarily would remain in the stomach. The bacillus may also be transported by the leucocytes in the mesenteric ganglia through sound epithelia. Jemma also gives confirmatory experiments. It is, therefore, quite well established that tubercle bacilli can and do pass over in the milk of the mother, and can and do infect the child through the alimentary canal, despite any possible interference from the gastric juice.

Basch and Weleminski were unable to demonstrate the bacillus in the milk, but freely admitted the injurious effect produced by a tubercular mother on the babe at the breast — an effect which they concluded was due entirely to the transmission of the toxins of the disease.

Pneumonia. The pneumococcus has been recognized and identified in the blood by many authors. Foa and Bordoni-Ufreduzzi found the germ in the uterine vessels, in the placenta, in the maternal liver, and in the blood of the fœtus.

Aymard inoculated a lactating rabbit with a culture of pneumococcus. Six days later the rabbit died from a generalized infection, and with a considerable quantity of diplococcus in the milk. Two hours afterward the young also died, and numerous diplococci were found in the blood, both by microscopic examination and by culture.

The microscopic examination of the breasts showed numerous diplococci in the ducts and no inflammatory reaction in the adjacent tissues.

Aymard also reports a case: The woman was seized with the initial chill of pneumonia four days after labor; child removed from the breast thirty-six hours later. Mother died in three days, and the post-mortem confirmed the diagnosis completely. Babe continued well for two days after maternal death; then the milk of the wet-nurse seemed to disagree and the babe had vomiting, green stools, diarrhœa, fever, and tympany; autopsy showed a suppurative cerebrospinal meningitis, and purulent peritonitis. The pneumococcus was the only organism found.

The one deduction possible is, that the woman with pneumonia should not nurse her child. Not alone pneumonia, but every form of germ infection should prohibit the child from taking the breast, since the bacteriæmia is quite liable to infect the milk. This includes typhoid and cholera.

Syphilis is so well studied that it is sufficient only to make mention of it here.

Acute Contagious Diseases and Erysipelas in the mother would, of course, preclude the nursing of the babe.

From a study of the foregoing material, it seems certain that the mother, who is abandoned to the care and nursing of her babe without expert advice, quite commonly gets bad results and not infrequently fatalities. The increase in the weight of the babe should be regularly followed on the scales and accurately recorded; the stools frequently examined; and when cutaneous manifestations appear, such as erythyma, even though slight, the milk of the mother should be analyzed and her physical condition investigated.

We find that while the return of the menses need not necessarily contraindicate nursing the babe, yet if the child begins to show digestive disturbance and intestinal irritation, this source of trouble, so often overlooked, should be taken into consideration, and its effect carefully estimated.

The same deduction must be made in regard to mental disturbance during lactation, while albuminuria and cardiac lesions, unless quite unimportant, will more often require removal of the child on account of the mother rather than the child. Removal from the breast is imperatively demanded for the sake of mother or child, or both, when lactation is complicated with mania, or epilepsy, except in very light and infrequent attacks.

Salge maintains that a mother with scarlatina, measles, and diphtheria should continue to nurse her babe, and claims that the ingestion of such a nourishment will render the babe forever immune to these diseases.

Considering the ease with which streptococci enter into and disseminate themselves through the blood, this theory has very serious objections, and would appear to be highly dangerous. The risk in nursing a child under such conditions is far more hazardous than any possible benefit that could be secured. Further, it is

not probable that immunity to diphtheria would be conferred for a longer period in any case than when secured by injection of antitoxin — say from six to eight weeks.

Nephritis, serious and obstinate erosion and fissure of nipple, Paget's disease, scirrhus, sarcoma, or abscess of the breast, together with local or systemic tuberculosis, syphilis, erysipelas, acute articular rheumatism, acute pulmonary or pleuritic affections, and all infectious and contagious diseases, osteomalacia, and all puerperal infections that are not mild and transitory in character, as a rule, demand the absolute separation of mother and child.

BIBLIOGRAPHY

Anarion. Centralbl. f. Kinderh., bd. 1 (1877–78), p. 38.
Alapy. Wien. Klin. Wchr., 1–2–3, 1879.
Appert. Thèse de Paris, 1893.
Arbel. Thèse de Paris, 1890.
Arthius. Thèse de Paris, 1876.
Aust. Med. Chir. Runds., 1886, hft. 1, 2.
Aymard. Thèse de Paris, 1891.
Burzagli. La Semaine Mèd., 1906.
Bouquet. Bull. Gen. de Therap., No. 3, 1906.
Bang, Ivar. Berl. Klin. Woch., 1897.
Bouchut. Gaz. des Hôpit., 1876, No. 89.
Bouchut. Traité de pratique sur le nouveau-nè.
Budin. Le Nourisson, Paris, 1900.
Budin et Demelin. Manuel pratique d'accouche et d'allait.
Bennizon. Thèse de Paris, 1884.
Boissard. Semaine Mèd., 1893.
Bouchacourt. Dict. Encyclop. des Sciences Med. 1871.
Bramwell. The Lancet, 1809, No. xi.
Bistrow. Virchow's Arch., bd. 45 (1869), p. 98.
Baum u. Seeliger. Arch. f. Wissenschf., bd. 22.
Baum. Monatschrift f. Prakt. Thierheilk., iii, hft. 9.
Bunge. Ztschr. f. Biol., bd., x, (1874).
Baumgarten. Centr. f. Klin. Med., 1883.
Bouchard. Revue de Mèd., 1881.
Bosselut. Thèse de Paris, 1888.
Boulay. Thèse de Paris, 1890.
Bouvier. Thèse de Paris, 1901.
Briens. Thèse de Paris, 1902.
Basch u. Weleminski. Berl. Klin. Woch., 1897.
Briens. Thèse de Paris, 1902.
Basch u. Weleminski. Berl. Klin. Woch., 1897.
Chassaignac. Gaz. Mèd. de Paris, 1855. Traité Pratique. Gaz. Mèd. de Paris, 1885.
Charrin et Karth. Rev. de Mèd., 1883.
Combe. Thèse de Paris, 1888.
Chevallier. Mémoire sur le Lait, Paris, 1839.
Coronedi. Ref. in Thiemich.
Catoliotti. Thèse de Paris, 1889.
Chavane. Thèse de Paris, 1893.
Cohn u. Newmann. Virch. Arch., bd. 126.
Couder. Rev. des Mal. de l'enfance, 1890.
Cornet. Tuberculosis, 1906.
Demelin. Rev. Obst. int., Toulouse, 1898, p. 145.
Dluski. Thèse de Paris, 1894.
Daniel. Thèse de Paris, 1883.
Delbet. Traité de Chir.
Duplay. Gaz. Hebdom., 1891, No. 5, p. 52; also Sem. Mèd., 1891.
Doleris. Arch. de Tocol., 1874.
Dubar. Thèse de Lille, 1883.
Damaschino. Rev. de Mèd., 1887.
Demme. Wiener Med. Bältter, 1888, p. 164.
Delaparte. Thèse de Paris, 1880.
Dassien. Thèse de Paris, 1887.
Damourette. Thèse de Paris, 1897.
Dufrenois. J. de Mèd. et de Chir. Prat., Paris, 1833.
Davis, Ed. P. Primary Tubercle of Breast During Pregnancy.
Epstein. Jahrb. f. Kinderheilkunde, bd., vii.
Evans. Br. M. J., 1885.
Escherich. Fortschrit. f. Med., 1885.
Friedjung. Wiener Med. Woch., No. 13, 1906.
Fehling. Arch. f. Gynäk., bd., 27.
Fubini and Cantu. Klin. Beobacht. z. Naturlehre, bd., 14.
Fieux. Rev. Internat. de Med. et de Chir., 1887.
Friedrichs. Dissert. Würtzb., 1893.
Foa et Bordoni-Ufreduzzi. Ztsch. f. Hygiene, 1888.
Goropp-Besanse. Arch. f. Phys. Heilk., viii.
Gemmel. Berl. Klin. Woch., 1877.
Gerlach. Virchow's Arch., 1878.
Gamaleia. Ann. de l'Institut Pasteur, 1888.
Gardien. Traité d'Accouche.
Gauthier. Ann. de Gynéc., 1879.
Gillet. Thèse de Toulouse, 1898 (Ref. Bouquet).
Hammerbacher. Pflüger's Arch., bd. 33.
Harmer. Inaug. Diss., Marburg, 1847.
Hamburger. Prag. Med. Woch., bd. ii, p. 69.
Hutinel et Claisse. Rev. de Mèd., 1893.
Heil. Monat. f. Geb. u. Gyn., bd., xxiii, 1906, p. 340.
Johne. Deuts. Ztsch. f. Klin. Med., bd. viii, 1884.
Jaccoud. J. de Mèd. et de Chir. Prat., 1891.
Jochkewitch. Thèse de Paris, 1899.
Jacob. Thèse de Paris, 1898.
Jolis. Thèse de Paris, 1895.
Jemma. Abst. l'Obstet., Mar., 1906.
Karlinski. Prag. Wochenschr., 1890, No. 22.
Klink. Viertel Jahreschr. f. Dermatol. und Syphilis, 1876.
Klemm. Jahrb. f. Kinderheilkunde, bd. 47.
Klingman. Deutsch. Med. Woch., 1892.
Köppe. Jahrb. f. Kinderheilkunde, bd. 47, 1898.
Lewin. Toxicologie, ii, Auflage, 1897.
Loughlin. Phil. Med. Times, 1873.
Löwy. Wiener Med. Presse, 1880.
Lewald. Habilitationschrift, Breslau, 1857.
Leroux. Rev. de Mèd., 1882.
Landrouzy. Rev. de Mèd., 1887.
Lemoine. Prog. Mèd., 1884.
Lehallais. Thèse de Paris, 1887.

LONGARD. Arch. f. Kinderh., bd., viii.
LOYER, PIERRE. Thèse de Paris, 1904.
MARFAN. Traité de l'Allaitement, 1899.
MARFÁN. Rev. Mensuelle des Mal. de l'enfance, 1893.
MERRITT. Thèse de Paris, 1887.
MICHAEL. Diss. Würtzb., 1886.
MEUNIER. Thèse de Paris, 1891.
MENDELSSOHN. Thèse de Paris, 1902.
MOSSÉ ET CATHALA. Semaine Mèd., 18. No. 21.
MEUNIER. J. de Mèd. et de Chir. Prat., 1898.
MEYER, PAUL. Inaug. Diss., Marburg, 1901.
NEUFELD. Thèse de Paris, 1901.
NETTER. Arch. de Physiol., 1886.
OUI. Ann. de Gynéc. et d'Obstet., vol. 38.
PINZANI. Journal de Mèd. de Paris, 1890. Gaz. des Hop., 1881.
PAULI. Dissert. Berl., 1879.
POUCHET. Arch. f. Kinderheilk., bd. viii.
PERIER. Ann. de Mèd. et de Chir., 1898.
PERRET. Prog. Mèd., 1903.
PETIT. Rev. d'Obstet. et de Ped., 1890.
PLANCHOW. L'Obstetrique, 1902.
POIRIER. Thèse de Paris, 1892.
PETIT. Thèse de Paris, 1892.
PHILIPPE. J. de Mèd. de Bord., 1893.
PINGAT, Thèse de Paris, 1891.
PLATZNER. Arch. f. Gyn., bd. 58, No. 2.
ROCHE. Thèse de Paris, 1901.
ROSSI-DORIA. Gazz. degli Ospedali, 1891.
ROULLAND. Ann. de Gyn., 1888.
ROUVIER. Le Lait, Paris, 1893.
ROGER ET GARNIER. Gaz. Hebdom. de Mèd. et de Chir., 1900.
ROSENHAUPT. Arch. f. Kinderh., 1904–5.
SUILLIER. Bull. Soc. Obst. de France, 1902.
SUINGNAND. Thèse de Paris, 1872.
SIGELAS. Rev. Mens. de Gyn. et d'Obstet., 1900.
SAUNDERS. Med. Rev., St. Louis, 1899.
SCHLOSSMANN. Monats. f. Geb. u. Gyn., 1903.
SONNENBERG. Deutsch. Med. Woch., 1890.
SPOLVERINI. Rev. d'Hygiene et de Med. Infantiles, 1904.
SCANZONI. Beitr. z. Geburtsk., ii, s. 86.
SCHAÜNSTEIN U. SPÄTH. Jahrb. f. Kinderheilk., bd. ii, p. 13.
SALGE. Berl. Klin. Woch., 1905.
TORNHILL. Jahrb. f. Paediatrik, bd. vii.
THIEMICH. Monats. f. Geb. u. Gyn., bd. 9.
TARNIER ET BUDIN. Traité de l'Art des Accouche.
TENISTOWITCH. Ann. de l'Institut Pasteur, 1887.
THOMSON. Edinb. Med. J., vol. xxxiv, p. 326.
TISSIER. Ann. de Mèd., 1891.
UFFELMANN. Arch. f. Hygiene, 1880.
VERNIER. Gas. Obst. v. Paris, 1876.
VERNON ET BECQUEREL. Ann. d'Hygiene, vol. 49–50.
VERGADE. Thèse de Paris, 1881.
VERNEUIL. Rev. de Mèd., 1882.
VECHÈRE. Thèse de Paris, 1884.
WALLEIN. Rev. d'Hygiene, 1881.
WICHINSKY. Thèse de Paris, 1883.

SUCCESSFUL TREATMENT OF CHRONIC GONORRHŒAL ENDOMETRITIS[1]

BY G. KOLISCHER, M.D., CHICAGO

CHRONIC gonorrhœal endometritis represents one of the most difficult propositions with which the gynæcologist has to deal. The great number of methods that are suggested for curing this condition prove convincingly how far from uniformly successful all these methods are. I, for one, have to admit that, after having tried for many years everything that was recommended in this line, I failed in the vast majority of cases to obtain the desired result.

In recent years, however, in the light of certain urological experiences, I have developed a method which, I think I am entitled to say, answers the demands. There are two main desideria that a method for treatment of gonorrhœal endometritis must meet: 1. It must eradicate the gonorrhœal infection; and, 2. It must stop the abnormal discharge. Furthermore, the intrauterine applications should neither provoke spreading of the gonorrhœal infection to the appendages, nor make old processes there flare up again.

Before entering into the details of this treatment, I wish to state that the method was employed in 43 cases of this kind; of these, 4 discontinued the treatment before it was finished, 7 could not be reached after having been discharged as cured, 3 became reinfected; the balance appear to have been cured, the last case related in this article having remained well through four periods of menstruation.

[1] Read before the joint meeting of the Chicago Gynæcological and Medical Societies, March 20, 1905.

A drug, in order to be employed successfully in the cervical canal and in the uterine cavity, should be a strong germicide and should produce sufficient reaction to secure an intense shedding of the integument; at the same time it should not produce cauterization to such an extent that a real eschar be produced. It is a matter of experience that in chronic gonorrhœal mucosa troubles only frequent applications, repeated at short intervals, will produce results. If the drug applied should cauterize the mucosa, the next application would touch only the crust and not reach the tissue in which we wish to produce reaction. As such a drug, albargin recommended itself, having shown all these qualities when used in gonorrhœal troubles of the urethral mucous membranes.

In detail the treatment may be described as follows: At first every uterus, in which intrauterine applications are contemplated, should be tested as to its reaction toward the introduction of a foreign body into its cavity. If this precaution is omitted, the operator will occasionally encounter a uterus that will react to any intrauterine interference with such violent contractions that the resulting uterine colic may last several hours, even causing the patient to faint from pain. Such a test is made by introducing, very slowly and carefully, into the uterine cavity a uterine sound lubricated with glycerine, finally touching the endometrium of the top with the tip of the sound. Under ordinary circumstances the patient will not display any signs of discomfort, but if one encounters a highly sensitive uterus, the sounding of the endometrium at the fundus will be perceived as a rather keen pain, and the uterine musculature will react by contractions, engaging the sound. In such event, these soundings should be repeated until the sensitiveness of the uterus is sufficiently obtunded to allow of actual treatments.

In administering the treatment, the cervix is opened by a bivalve speculum, after which the portio and the adjacent parts of the vagina are cleansed, either by irrigating or by swabbing with an antiseptic solution. Then the uterine cavity and the cervical canal are freed from adherent pus and mucus, by introducing a swab saturated with a concentrated solution of bicarbonas sodæ. These swabs are best made of toothpicks armed with absorbent cotton; they are, of course, sterilized before being used, and are inserted into the uterus by means of a long, slender forceps. It is absolutely unnecessary, and in fact rather objectionable, to try to wipe off the mucus with this swab. If this applicator is left for a minute or so in the uterus and then withdrawn, the liquified mucus and pus is expelled as a big plug; this is now removed and the uterus is ready for the introduction of the silver solution. In case difficulties are encountered in introducing the swab, the anterior lip of the portio is seized by a tenaculum or by a vulsellum; the uterus, however, should never be drawn down, it should simply be steadied, otherwise, in snapping back after being released, it might pump infectious matter up into the parametria and the appendages.

A swab soaked in a three per cent albargin solution is now introduced into the uterine cavity, and is allowed to remain there for five minutes; after it is withdrawn, a tampon, carrying an ichthyol-glycerine solution of equal parts, is inserted into the vagina and pushed up against the portio. The next morning, the patient removes the tampon, cleanses the parts with a hot douche with salt water, and is ready again for the next treatment. As a rule, a slightly bloody discharge appears after a few treatments. This interferes not at all with the continuance of the treatment; on the contrary, it seems rather a favorable symptom.

These treatments are continued daily until the discharge disappears and until repeated examinations of the mucus from the uterus and from the cervix fail to show either pus cells or gonococci. These specimens should be taken after provocatory influences have been brought into play, such as during and after menstruation, twenty-four hours after the patient has taken some charged alcoholic beverages, or twenty-four hours after the mucosa has been touched up with a 1-1000 bichloride solution.

Occasionally one will encounter rather torpid cases, in which even the albargin solution fails to produce sufficient reaction. In such event, the necessary stimulation is brought about by saturating the applicator with a forty per

cent formalin solution and introducing it into the uterine cavity. The withdrawal of this formalin swab, however, should be immediately followed by the insertion of a large ichthyol tampon, in order to keep the formalin solution from flowing down into the vagina and vulva, an accident which excites very severe smarting on those parts. This application is occasionally repeated during the course of the silver treatment.

In case the endometrium proves to be very rough, the whole course of treatment is preceded by an abrasion of the mucosa with a sharp curette; this is done, not because it is believed that such interference influences the gonorrhœal infection, but in order to put the tissue in a condition more favorable for treatment. The applications are started after the discharge following the curettement has lost its bloody character.

A success can, of course, be expected from this treatment only if one succeeds in excluding the source of reinfection. The time during which the diseased cervix and uterus are treated is also the best time for attending the chronic gonorrhœa of the male partner.

CASE REPORT OF PLASTIC REPAIR IN OLD GUNSHOT WOUND OF THE ABDOMEN

By J. K. MARDEN, Marsovan, Turkey

Greek patient from Ordu, age 35.

Previous history: Was shot with a rifle-ball six months before. The ball passed through the ileum, coming out of the abdomen two inches above crest of the pelvis in the left hypogastric region. There was no surgeon in his village, and nature healed the wound as best she could. The man lived, but there was a fecal fistula.

He went to Trebizond where a surgeon attempted to close the wound. The result of this operation was a large slough, and the man was much worse than before. Six months after the accident he came to our hospital, two days' journey by steamer on the Black Sea, then two days' by wagon. Examination of patient on arrival, showed a large opening in the intestine, through which all fecal matter discharged. There was much cicatricial tissue about the wound — the result of the unsuccessful operation done some three months before.

Operation: Under chloroform, the wound was cleansed as thoroughly as possible. The intestines had been emptied as completely as possible the day previous, and a small tampon of sterilized cotton, attached to a silk thread, was introduced into either end of the intestine. The field of operation was then thoroughly cleansed with alcohol, ether and bichloride. An incision was made in the normal tissue, on three sides, down to the peritoneum. Next to the pelvis, the parts were very adherent. The peritoneum was opened, and the intestine drawn out as far as possible. The abdominal cavity was carefully packed-off with sterilized pads. Though the wound was over the descending colon, the small intestine was the one that was injured. This was resected, an end-to-end anastomosis was performed, and the intestine returned.

The difficulty lay in closing the abdominal opening. So much had sloughed off or was mere cicatricial tissue with no muscular tissue beneath, that I decided to take a flap from the groin, including skin, muscle and fascia, and do a plastic operation. As far as possible, the peritoneum was approximated, after which the new flap was adjusted.

The patient made an uneventful recovery and went home in one month, perfectly well.

DEPARTMENT OF TECHNIQUE

A SIMPLIFIED TECHNIQUE FOR SUPRAVAGINAL HYSTERECTOMY

BY WILLARD BARTLETT, A. M., M. D.
Professor of Experimental Surgery, Washington University, St. Louis

Most supravaginal amputations of the uterus, done within the abdomen, are for myomata of that organ. We know perfectly well that a characteristic heart lesion complicates many of these cases; hence, it is of paramount importance that such patients be operated upon with the greatest celerity which may be consistent with first-class work. Of course, the anatomical variation in these cases is so great that it is impossible to consider them as a unit; still, for the sake of argument, I will state that considerable observation in this line of surgery has convinced me that slow operators, in general, consume on an average something like two hours in an operation of this kind; fairly good operators take something like one hour for it; whereas, it seems to me that our really expert surgeons, who are doing a large amount of work, usually take about thirty minutes to complete the procedure, when the classical ligations, etc., are made, and the abdomen closed in layers.

A simple method of treating the stump, which we have been using at St. Anthony's Hospital for the past year or two, facilitates the work so greatly that practically all of these operations are done, without any haste, within a period of fifteen to twenty minutes, and I am sure that some of the wizards of the profession could complete the whole thing in considerably less than the time specified.

The round ligaments are clamped, and divided near their origin; the bladder stripped down as far as may be desired on the anterior surface of the cervix; the broad ligaments are clamped and cut close to the uterus, and then a ligature passed around the branches of the uterine vessels which run parallel on each side to the neck and body of the organ, it being drawn tight as they are cut across. These six structures being divided, nothing remains but to cut across the cervix in such a manner that a wedge-shaped opening is left, transversally disposed. Two clamps remain on either side, one on each round ligament, and one on each broad ligament. These structures from one side are placed in this wedge-shaped opening; a ligature is carried through the posterior uterine wall, and under them on out through the anterior wall, then brought back over the masses held with two clamps on the same side, and tied, as though the object were merely to close up the wedge-shaped defect. The same needle and thread then take care of the two clamped masses on the opposite side, in exactly the same way. This maneuver being complete, it will be seen that the round and broad ligaments from the two sides are simply locked in the wedge-shaped defect between anterior and posterior walls of the uterine stump. Care is taken to pass the needle through upper and lower edges of these flat pedicles, when passing the same under and over them, in order that there may be no possibility of them slipping out of the wedge-shaped defect. The resulting knots are on the posterior wall of the stump.

Now, to complete a peritoneal autoplasty, it is merely necessary to catch one bite with the same needle in the peritoneum covering the bladder, and tie the two resulting ends. It will be seen that but one needle and thread have been used in the entire procedure within the abdomen, exclusive of the treatment of the two uterine arteries, and the operator who completes this technique for the first time will be astonished when he looks at the clock.

We realize that it is a return from the ligature of each vessel singly to ligature "en masse," but this theoretical objection does not outweigh the value of time saved, in our opinion.

A very large number of these operations have been done at St. Anthony's since we have been using this treatment of the stump, and in only one instance have we found it necessary to vary the procedure and in that, not enough of the stump was left for this performance.

AN IMPROVED HODGEN SPLINT FOR THE TREATMENT OF FRACTURES OF THE THIGH OR OTHER PAINFUL AFFECTIONS OF THE LOWER EXTREMITY[1]

R. GEORGE S. BROWN, M.D., [illegible]

The Hodgen splint was a modification of the Smith's Anterior Splint. The Smith's Anterior consisted of a stiff wire frame, bound to the anterior aspect of the thigh and leg; and was useful chiefly for suspension. Hodgen widened the space between the side-bars of this splint so that the limb could drop between and, pinning the encircling turns of roller bandage to the side-bars of the frame, cut away that portion of these turns which covered the front and used the under-lapping portions as a hammock to support the limb. As his intention was to use this modified splint for extension as well as suspension, he adopted the adhesive strips and foot-block of Buck to fix the limb in the splint.

Although a few good articles have been written on this subject for the journals, the text-books, as a rule, have given it very little space. With the exception of the very excellent article by H. H. Mudd in Park's Surgery, they have usually printed the picture of it, saying nothing at all of the principles of its action nor of its application.

Another reason for the general neglect of this useful appliance, is the difficulty of conveying in written words an adequate idea of its usefulness, or indeed of making the application of it clear. The chief reason, however, for its being so often abandoned after one trial is that the splint, as used by Hodgen and as at present pictured in the text-books (Fig. 1.), is troublesome to understand and adjust, and difficult to keep in order. Those surgeons who have used it with my modifications though, have, I believe, continued to do so.

It is used by all the surgeons and general practitioners of our city; and at least six of these have had wide experience as internes in as many of the large hospitals in the east, and were trained to use different methods. They unite in saying they have never seen any method give such uniformly good results as they get from this.

Although I have been able to interest a number of surgeons over the country through short journal articles from time to time, during the last 10 years, and some others by actual demonstration, I hope that the more elaborate illustrations and more minute explanations of this paper will further the more general adoption which I am sure this very useful appliance deserves. It should, at least, lead to a fair trial of it when it is generally admitted that there is, at present, no treatment for fracture of the thigh that is anything like satisfactory — none at least that can be used by the surgeons, occasional surgeons and general practitioners who, in the nature of things, are compelled to treat the majority of these cases.

The principle of the Hodgen splint is to suspend the limb from the bed and to *utilize the weight of*

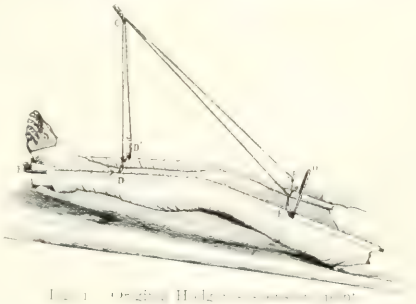

Fig. 1. — Hodgen Splint [illegible]

the limb in making the extension. When the limb is suspended, the bed is rolled toward the wall at its head until the suspension-cord is at a sufficient angle, and then the foot of the bed is elevated on blocks. When this is done the cord is pulling upward and away from the body, while the weight of the limb is pulling directly downward toward the bed; the resultant pull will be between the two or away from the body (the counter-extension or fixed point) toward the foot of the bed in a horizontal direction. The amount of the pull depends upon the weight of the limb and the angle of the suspension-cord; the direction of the pull is always horizontal but always in line with the swaying suspension-cord. This principle I have found to be of easier application and adjustment with the following changes I have made in the splint:

First. As the under-lapping strips of roller bandage would continually roll up in strings and

[1] Read in part at meeting of the Southern Surgical and Gynecological Association, New Orleans, December [illegible]

cut the patient's skin and otherwise get out of order and, as they were clearly merely a survival of the roller bandage of Smith, I substituted one piece of cloth as a hammock. In order to keep this hammock taut, I fastened the four corners of it to the loops at the upper and lower corners of the frame to be described later.

Second. I substituted four leather straps for the two supporting cords. These straps had holes close together, so that by shifting the buckles the lengths could be adjusted nicely. At the suggestion of my friend, Dr. Perkins, of New Orleans, I later replaced these straps with the small cords and tent-blocks as being better and cheaper.

Third. In the endeavor to find some means of measuring the amount of the traction applied, I placed a cheap spring-scales on the end of the suspension-cord and on the hook of this hung the four small cords. I found that it answered another useful purpose in giving a very comfortable jigger or elasticity to the pull.

Lastly. While retaining the traction adhesive strips, I have done away with the foot-block of Buck. The application, adjustment and maintenance of this splint are simple; and I hope the following detailed description of it may not appear too complicated.

Fig. 2 shows the frame of the splint. It is made of $\frac{3}{16}$ inch iron rod or No. 4 wire, all in one piece except for the arch "J" which regulates the width of the upper end of the hammock. Making this frame "rights and lefts" by making one side longer than the other is not necessary. Some have made this frame of adjustable length, but such invariably get out of order and are more complicated and expensive by far than this simplified one that any tinner can make to measure in half an hour.

The loops, aa., at the proximal end are for the accomodation of the hook-ends of the arch "J" and also to afford a place through which to fasten the upper corners of the hammock cloth to keep it from slipping downward toward the knee. The width of the distal or foot-end of the frame is usually about four inches, and each corner is equipped with an upright loop of stiff wire (bb.) two inches high and soldered tightly to the corners. These loops afford anchorage for the lower corners of the hammock and keep it from slipping up toward the knee. They also take the place of the foot-block by affording a place through which the muslin ends of the traction-strips can be passed and tied opposite the sole of the foot. Four short wire-loops or rings are fastened to the upper aspect of the side-bars of the frame in the positions indicated by c,c,c,c. For small, medium and large sized adults the upper two of these rings

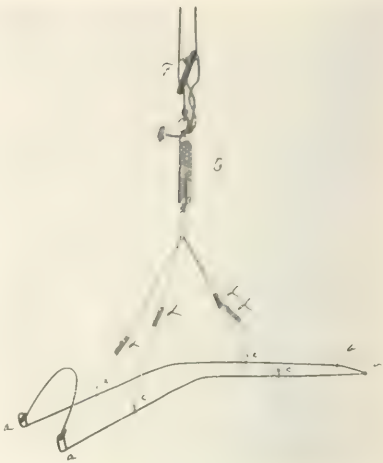

Fig. 2.

will be almost always about seven inches from the level of the perineum; and the two distal ones should be about 14 to 16 inches toward the foot, from the upper ones, or about 21 or 22 inches from the perineum. With these rings in these positions it does not matter if the frame extends some distance beyond the foot. The frame should be slightly bent at the level of the knee before it is applied but it is made straight. With the four small side-rings soldered tightly in the places indicated, a stock of three frames of different lengths will cover all cases. The frame should be at least two inches longer than the limb, but will answer as well if it is four or six inches longer. The wire rings c,c,c,c. are for the attachment of the four small supporting cords, equipped with the tent-blocks d,d,d,d. These small supporting cords should be made of hard, plaited cord, $\frac{1}{8}$ inch thick, that will not stretch; but if this cannot be had the ordinary trot-line "staging" will do. The small tent-blocks should be made of hard wood, that will not split, $\frac{1}{2}$ inch thick, $\frac{3}{4}$ inch wide and two inches long, with a hole half an inch from either end. The cord is passed through this hole and knotted; then the other end of the cord is passed through the hole at the other end in the reverse direction and tied in the wire-loop "a." thus leaving a loop in the cord above the tent-block which is to hang with its fellows on the hook of the spring scales "E." This is attached to the suspension

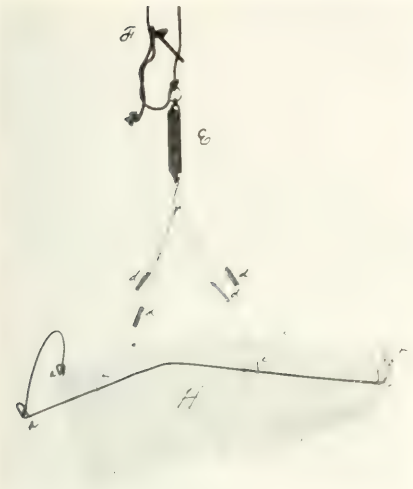

Fig. 3

sash-cord and large tent-block "F," which are hung from the pulley-wheel in the ceiling.

Fig. 3 shows the frame with the hammock "H" attached to one side. This cloth is cut at each of the four corners and the cut corners pinned through the loops to keep the hammock taut; it is also cut two or three inches deep at the sites, c, c, c, c, for the accommodation of the small rings. It is made to fit the under surface of the limb by adjusting the safety-pins along the outer bar of the frame. The hammock is best made of light canvas or heavy unbleached muslin; and if there are wounds to be dressed, one end or the other can be unpinned and turned back out of the way while the remaining portion supports the limb. If the wound is at the knee, the cloth can be in three parts, so that while the middle one is removed or tucked back the thigh and leg portions will support the limb.

Fig. 4 shows the splint being applied to a simple fracture of the thigh anywhere from the condyles to the anatomical neck. The whole limb is cleaned and shaved and a two or three inch width of zinc oxide plaster is applied to either side, from two inches above the knee, along the leg, to two inches below the malleoli. These two inches are then folded back and stuck on itself opposite the malleoli. To each of these folded ends of the plaster traction-strips, we then pin about a foot of stout muslin roller of the same width, with two strong safety-pins. These muslin ends, k, k, are, later on, to be passed through the distal loops, b, b, and tied opposite the sole of the foot: thus fixing the limb in the splint and doing away with the foot-block. If the limb is of large size, the zinc oxide adhesive strips may be made double-thick and should always be re-enforced by a muslin roller up to the knee.

The leg having been equipped with the adhesive strips as just described, the surgeon now leans over the foot of the bed and, steadying himself against it, takes the patient's foot in one hand and his calf in the other, and straightens the limb out on a pillow. He holds it there with a gently maintained pull, just sufficient to oppose the muscular spasms of the thigh muscles. The assistant now takes the splint, to which has been attached the hammock and the four small supporting cords with their small tent-blocks, and, as the surgeon (still keeping up steady traction) gently lifts the limb an inch or two from the bed, slips it under and hooks in place the arch "J." The surgeon now allows the limb to rest upon the hammock with the pillow underneath and, while still maintaining a steadying pull with the hand which grasps the foot, with the other hand he pushes the splint well up against the perineum while the assistant passes the muslin ends of the traction-strips, "k, k," through the loops, "b, b," and ties them in a bow-knot opposite the sole of the foot, as the whole is shown in Fig. 5. (Note: unfortunately the patient used for illustration in Figs. 4 and 5, had a plaster dressing on a sprained ankle; this has nothing to do with our appliance, the Hodgen splint.)

Fig. 4

Fig. 5

The surgeon now relinquishes the foot to the assistant and, gathering up the four small supporting cords, he loops them over the hook of the spring-scales "E" on the end of the suspension sash-cord "F", which has previously been passed over the pulley-wheel in the ceiling and equipped with the large tent-block. He then grasps the spring scales with one hand and the large tent block with the other and by gently lifting the one and pulling down the other, the limb is raised from the bed. When he releases his hold, the large tent block "pinches" and the whole remains suspended.

The safety-pins, fastening the hammock of the inner bar of the frame, having already been adjusted evenly and permanently, the pins along the outer bar are next readjusted, one at a time, to make the hammock fit the contour of the under side of the whole length of the limb. If necessary now, the the frame is again pushed up against the perineum and the traction-strips, "k, k," retied (again in a bow-knot) opposite the sole. The small cords and tent-blocks, "d,d,d,d," are next readjusted until the limb hangs level.

Next the eversion is now over-corrected by slightly shortening up the two small supporting cords, "d, d," on the outer bar of the frame, and by rotating the limb inward and propping it there with rolls of cotton between it and the outer bar, at the ankle, calf, knee and the thigh below the fracture. The bed is now moved gently on its rollers until the suspension-cord hangs exactly perpendicularly and the weight of the whole noted as indicated on the spring-scales (Fig. 6).

Traction is applied now by simply rolling the bed toward the wall at its head until the suspension sash-cord is at an angle of from twenty to thirty degress from the perpendicular. The rollers should now be removed from the foot-legs of the bed and they should be elevated on heavy blocks from 6 to 10 inches high. These blocks should have holes in the top an inch deep, for the legs of the foot of the bed to rest in, and prevent them from slipping off. These blocks should also be smooth on the bottom, so that they will slide over the floor with a slight effort to admit of easy adjustment of the position of the bed from time to time.

It will be noted now that the spring-scales indicate an increase in the weight on them; the difference between this and the weight noted when the cord was perpendicular, will be, approximately, the amount of traction being exerted. The angle of the suspension-cord and the elevation of the foot of the bed should be varied according to the weight of the patient and his limb. From a child of eight years up to a patient weighing 200 pounds, the net pull will vary from five to twelve pounds.

Long, flat, half-filled sand bags, weighing from two to six pounds, laid on the uncovered anterior aspect of the thigh will be found to serve two very useful purposes: i.e., they will add weight to the limb, thereby increasing the pull, and by their weight also they will control the muscular spasm which is otherwise troublesome during the first

Fig.

week. Finally the foot of the bed should be pushed aside a few inches so that the injured limb will be pulled in a slight degree of abduction. This final position is shown in Fig. 7.

When the principles of this splint are understood and appreciated, the application of it will be found simple and the nice adjustment of it, to the many different conditions to which it is applicable substantial and efficient. This, however, was not true of the old splint of Hodgen. In the cuts of the old splint in the text-books, the swing and limb seem to hang perfectly when as a matter of fact one defect alone renders it impossible to adjust it so that it will ever hang level. This is the absence of the small tent blocks; when these blocks are not used the weight of the leg sags down and tilts forward the lower fragment of a fractured thigh, owing to the fact that *the weight of the leg from the knee down is greater than the weight of the thigh, from the knee up to the fracture.* This can be perfectly regulated in the improved splint, while in the old one these cords could not be regulated at all without letting the limb down on the pillow, and even then the "lift" could not be shifted from the leg to the thigh or vice versa. It is most important to apply this splint in a manner that will be at once simple, substantial and cheap; or rather, I mean by the latter, it can be better made if one follows the plan I have developed of making each part to be assembled such as can be made or bought for a few cents at the village hardware store. These articles are: The wire or iron frame, made by the tinner; fifteen feet of sash-cord, one and a quarter yards of light-weight canvas, one ball cotton "staging," two dozen safety-pins, one spring-scales, one screw pulley-wheel, adhesive plaster and roller bandage and the tent-blocks.

The frame should be made in the simple manner I have indicated as all adjustable screws and telescoping improvements are difficult to keep in order or, I should say, impossible to keep in order: because they will rust when not in use or will get bent and will not telescope, besides which they are unnecessary. This splint, like all other splints, should be made on the spot, though the frame can be thrown in a closet and taken out rusty ten years later, it will be found just as serviceable as it was at first, and at a small cost of time and money the other simple items can be got together new. The splint can be put up *substantially*, just as cheaply and as easily as not. Care should be taken that the adhesive strips do not stretch, that the cords will not break nor stretch, and that the tent-blocks will not split and that the cords, passing through them, will pinch and not slip.

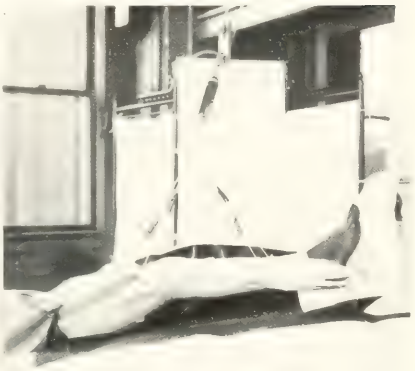

Fig. 7

It is not necessary that the outer bar of the frame be longer than the inner, thus making the splint "rights and lefts" and allowing the upper edge of the hammock to follow the gluteal fold and support the upper fragment even in fractures of the neck, *as the fracture is always sufficiently supported by the tension of the muscles when the traction is applied.*

Figs. 8 and 9 will illustrate my meaning; a piece of broom-handle, cut through obliquely to represent an oblique fracture of the thigh with rubber bands attached to represent the muscles. The fragments overlap, when the muscles are contracted, and when the over-lapping is pulled out the muscles give a very decided splinting support to the fragments.

This is always sufficient support for simple fractures in this splint because, in addition, the muscles are, in turn, well supported by the hammock and, owing to the fact that the ligaments of the hip-joint are non-resistant, there is little or no disturbance of the seat of fracture by any ordinary movements of the patient's limb or body. *With*

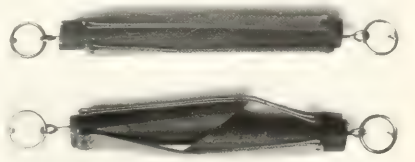

Fig. 8 and 9

every movement of the limb or body, the limb and splint swing, as a whole, between the ligaments of the hip-joint and the suspension-rope and so automatically adjusts itself, that the seat of fracture is not disturbed by any reasonable excursions the patient may make over the bed in attending to his daily wants and conveniences. What little movement occurs probably hastens the formation of the callus.

The suspension-cord should never be swung to any attachment on the bed itself, because then the angle of the pull cannot be increased nor diminished to amount to anything; neither should it be hung from a frame that is unsteady and not high enough. This splint seems to be the one surgical appliance that can be better used in a private residence than in a modern hospital, because in the former a screw pulley-wheel can be put in the ceiling. In some hospitals this will not be permitted; and in others it is not possible because the ceiling is made of concrete. In such case the surgeon's ingenuity must provide some means of suspension that will be steady and substantial and have a height above the bed of six or eight feet, though ten or twelve would be better. *The longer the suspension-rope the less the pull required.* This fact is not easy to explain unless it is that the wider range of swaying motion, with the angle of the cord much less, gives a teasing pull from side to side, that is more effective than a steady straight-away pull that is much harder—much as the rocking, swaying pull of the obstetrical forceps will effect more than the dead-straight pull. If the suspension-cord is only two feet long above the bed, and while at an angle of thirty degrees shows by the scales that there is a pull on the thigh of ten pounds, increasing the length of this cord to ten feet without altering the angle, will not increase the weight of the pull as shown by the spring-scales but will increase it in *effectiveness* fully a hundred per cent. That is, the ten pounds shown by the scales with the rope ten feet long, will give a more effective pull in the way of reducing the shortening than if the ten pounds shown when the rope is two feet long were increased to twenty, either by adding sand-bags to the weight of the limb or by rolling the bed until the angle is so acute the scales will show that much increase. With a short cord the pull must be greater to be equally effective, and the patient's movements are more restricted; he gets tired, the pull worries and hurts him; and he will finally allow himself to slip down in the bed until the foot-end of the splint rests against the foot of the bed in order to get rest from the painful pull and the cramped position. On the other hand, if the rope is long enough the patient is not made uncomfortable, hence his cooperation can always be had for the asking. Indeed, he soon learns that what the surgeon is trying to put in operation for the good of his limb is also the most comfortable. When a fracture of the thigh is put up in the manner described, with the suspension-cord at least six feet long, with the knee slightly flexed (the natural angle assumed when the limb is at rest), with the soft jigger of the spring-scales materially helping to neutralize the small shocks and jars, the patient is made absolutely comfortable and maintains the greatest pull ever needed with this splint (ten or twelve pounds) without complaint. The patient is comfortable because he has great liberty of movement, because there is no tension of the ham-string muscles and because the pull of ten or twelve pounds is so distributed it is not noticeable at any one place.

In the Buck's extension a pull of from 18 to 25 pounds is necessary, because the *friction of the limb on the bed* has first to be overcome before there is any pull on the muscles of the thigh: while in the Hodgen *the bed the limb is resting in goes along with it, and so the friction very materially lessens the pull on the traction adhesive strips instead of increasing it.* Again, in the Buck's the whole *twenty* pounds of pull falls on the straightened-out ham-string tendons while in our splint of the total pull of ten pounds at least three-fourths of it is taken off the traction-strips by the friction of the limb in the hammock.

On account of the pull of the Buck's being painful, the patient is always resorting to all kinds of shifty devices to have the pull interrupted. He will beg some friend to have mercy on him and put the weight up on a chair or the bed, where it is very common for the surgeon to find it. Or again, he will actually allow his heel to dig into the mattress until a slough takes place, rather than endure the agony of the pull. (Note: A surgical friend told me recently that he never used anything but the Buck's and that he overcame my well-founded objections to it by putting on twenty-five pounds and then for two weeks giving the patient all the morphine he wanted to keep him so easy that he would have no inclination to interfere with the pull. At the end of two weeks he puts on a heavy plaster dressing after the manner of Whitman. His results were only *fair.*)

When, with his pain-stimulated endeavor, the patient succeeds in interrupting the pull in any of these ways, the thigh muscles recover their activity and in this lies one of the important principles to be respected, if we hope to get these patients well without shortening. In order to pull out all the overlapping that takes place in an oblique fracture

of the thigh, the powerful *thigh muscles must be put out of commission: temporarily paralyzed — by prolonged and uninterrupted moderate extension rather than temporary violent extension or prolonged severe but interrupted extension.* In the Buck's these interruptions will constantly occur, in spite of every care, unless the patient's pain is constantly relieved with morphin. In the Hodgen, as long as the limb is suspended and the cord at an angle, the pull is as constant as the law of gravitation and it will not be interrupted because the patient is comfortable and has no desire to interrupt it. If the suspension-cord is very short, the pull is straighter and the patient is more confined and the weight of the pull has to be greatly increased. Under these careless conditions the patient is made uncomfortable and evinces the same tendencies as the patient in the Buck's and allows the splint to rest comfortably against the foot of the bed. The suspension-cord of the Hodgen can be shortened until it acts upon much the same principle of the Buck's. Even with the shortest cord, however, it is not nearly so painful; the results are better and the patient has more liberty and no bed-sores. During the first week in the Hodgen splint, the patient is very much interested in avoiding the painful spasms of the thigh muscles and actually finds a pleasure in pulling up in the bed and increasing the traction, because he knows that is the surest way of avoiding them. After the first week he *keeps* himself pulled-up because he has formed the habit, because the surgeon advises him to do so and because he finds it more convenient in every way. These patients sit up in bed from the first to eat, write, bathe, and use the bed-pan, and when they lie down they can turn almost one-fourth of the way to either side. If it has been substantially applied, it is almost automatic in its action and does not require one-fourth the amount of attention from doctors and nurses necessary in other methods.

Of the three principles involved or rather of the three objects to be attained in the treatment of simple fracture of the femur, all are met perfectly by the proper use of this splint. These are:

1. The avoidance of shortening. 2. The avoidance of angulation, and 3. The avoidance of rotation which is practically always eversion of the foot. The two first are disposed of when we have pulled out all the over-lapping; as the shortest distance between two points is a straight line, of course there can be no angulation when there is no shortening; and with this splint, shortening can be eliminated in all cases. The constancy of the traction causes a rapid atrophy of the thigh muscles and the very moderate pull of eight or ten pounds, in a patient of medium adult size, will pull out all the overlapping in ten or twelve days; and by reason of the uncovered thigh and the rapid atrophy of the muscles, the formation of the callus can be followed from day to day by the surgeon's fingers. Owing to the slight irritation of the seat of the fracture the callus formation is, I am sure, more rapid than with other methods of treatment. Usually by the end of the third week, if by neglect the shortening has not been all pulled out, I have found it impossible to do so after this. In contrast to this, one case fell into my hands, that had had on a plaster splint four weeks. When this was cut off there was found to be four inches shortening. I put him in the Hodgen purely as an experiment; and by extra-weighting the limb, greatly increasing the usual angle of the supporting cord and elevating the foot of the bed and tying his shoulders to the head, at the end of four weeks more, three of the four inches had been pulled out, and he recovered with one inch shortening.

When careful daily measurement shows the limb to be as long as its fellow, the pull may be moderated: although the patient never complains of the pull. The patient frequently complains mildly during the first week or two of the heel or some other part of his limb resting too heavily on the hammock; this can be instantly relieved by loosening the canvas under that part, or tightening the part of the canvas on either side of it by means of the safety-pins along the outer bar of the iron frame. Or again, he may say his limb below the knee is sagging too low or is lifted too high; this is remedied in a moment by shifting one or two of the small tent-blocks. He *never* complains of the pull. Usually it is the mere tedium that annoys him and the slightest change of any kind will relieve him; most frequently merely raising or lowering the whole by means of the large tent-block above will satisfy him.

Rotation can be absolutely prevented by over-correcting the eversion in the manner I have described, of slightly raising the outer bar of the splint and rolling the limb over and propping it there with one or two rolls of cotton.

The chief point I wish to insist upon is, that *muscular resistance in these cases should be overcome gradually* and that it is a wrong principle to endeavor to reduce "or set" a fracture of the thigh under ether or chloroform, or expect it to stay reduced, if such reduction should be accomplished. This can very rarely be done and still more rarely can it be made to stay reduced. Such efforts are hard for the surgeon and assistants, painful to the patients and harmful from the possible trauma, and are not necessary because, with

the splint, reduction can be accomplished perfectly in two weeks with no trouble at all. The method of Bardenheuer (longitudinal and lateral traction) is complicated and requires the constant and careful attention of the surgeons and the best hospital care; and the same may be said of the extension-abduction plaster spica of Royal Whitman. Even admitting that their results are good, such treatment and after-care are out of the reach of at least four patients out of five: while this splint can be used anywhere by almost any one at little cost of time, money or work; is used without an anæsthetic unless for diagnostic purposes; gives the greatest comfort (to all concerned), the quickest recovery and by far the best results.

In fractures of the hip in old people, I and my professional friends in this vicinity have had most gratifying results. In nine cases of my own and about as many more in the practice of others that I have been consulted about, none has died and the majority have resulted in good union, little shortening if any and no stiffness of the hip or knee and no bed-sores.

This practice has been scattered over a number of years, and I have been able to get skiagraphs of only two of them. Some of the earlier cases were put up in the Hodgen, only with the object of making them comfortable and with no hope of getting union; and little or no extension was applied. Two of these resulted in no shortening; but union resulted in all but two.

Uniformly good and excellent results have been obtained in my own practice in something over 30 cases of simple and multiple fracture of the femur, but most of them were treated before we had the X-Rays, and most were in private houses, where an initial skiagraph could not be taken. Later on in this paper, I report briefly those cases in which a skiagraph was obtained. For more than 20 years we have habitually treated many other conditions than fractures of the thigh with this splint. Nearly all conditions of the limb, in fact, where rest, elevation, relaxation and the comfort of the patient might contribute to the recovery, viz., All compound fractures and dislocations, fracture of the patella, infections of the bone, soft parts or joints, resections of the hip (six cases) hip-disease and phlebitis. In such cases the limb is virtually removed from the body, so far as any movement of the body causing pain in the limb is concerned. When a painful limb is swung up in this way, it swings about and accommodates itself to every body-movement, because the limb swings as a whole between the ligaments of the hip-joint and the suspension-cord, and these are both non-resistant. All the patients, with resections of the hip-joint and [illegible] to convey in writing any adequate idea of the assistance given by the splint in dressing these cases, in changing the bed-linen and caring for them generally. In these and other compound cases, the hammock can be unpinned above or below or in the middle at the knee according to the situation of the wound, and, while it is being dressed, the remaining sections of the hammock support the limb more steadily and tirelessly than any two or three live assistants could possibly do it. The case of hip-joint disease (which I shall make the subject of another report) was of four months standing. The fever, pain and soreness and the starting pains had put her in the bed and three successive attempts to relieve her with plaster dressings had resulted only in her growing steadily worse. After one week in this splint, she played all over the bed and did not object to having her hip examined; and starting pains, which had kept her from sleeping for weeks, had all ceased. At the end of three weeks the fever, pains and soreness were all gone, when she left my care and went to a distant state to live.[1] I have suspected from this one experience that separation of the inflamed surfaces is the important thing, and not fixation, in the treatment of this disorder. The pull of the Hodgen separates the surfaces completely and constantly but by no means fixes the joint, and yet this child got better from the day it was put on and continued to improve in the most remarkable degree the whole time she was in my care. This child on her back, in a well-ventilated room got a great deal more exercise than she did sitting out-doors, watching the other children play while she herself was suffering greatly in the plaster.

Case 1. H., age, 30. In a railroad accident, eleven years ago, he sustained a simple fracture of the upper and middle third of the right thigh, and a crushing injury of the left thigh, necessitating amputation in the upper third. He suffered a good deal from sepsis and sloughing and the stump had to be dressed frequently for several weeks. This, together with the fact that his left limb had been cut off and we had nothing to compare the measurements with, and that shortening could affect only his stature any way, made us somewhat careless about possible shortening. According to the skiagraph there was overlapping, and of course there was shortening, though it is probable that most of it occurred after he got about. In one particular this splint may some times be the indirect cause of shortening. Patients lying with a limb in this splint get a great deal of exercise, so that at the end of eight weeks, when the condition of the thigh permits them to get up, the muscles of the arms, body and sound limb are always in fine condition, with not even any stiffness of the knee or hip, and they may get to putting

[illegible]

weight on the limb too soon and the callus yields. This man was on crutches by the twelvth week, and as he had only one limb and that the broken one, it had constantly to support his whole weight, whereas ordinarily the crippled limb would be protected by the other one for weeks after getting about. When this patient left the hospital in the ninth week, the atrophy of the thigh muscles was so pronounced, that I feel sure such a degree of overlapping as the picture shows would have been detected by the examining touch: but it was not, so I think the most of the shortening was caused by walking too soon and too much. The patient himself is positive this was the case.

Case 2. (Fig. 10.) Paul D., aged 8. In April, 1907, he fell from a tree and, landing on both feet, fractured both thighs in the middle thirds. His limbs were put up in two Hodgen splints at his home, a short distance out of town. The pulley-wheels were screwed into the board ceiling about 22 inches apart, to make the limbs swing in slight abduction. The suspension-cord was about 8 feet long above the bed. Owing to the slight weight of the limbs there was, as is usual, a good deal of muscular spasm for the first week. To correct this and to give weight to the limb so that the traction would be greater, two long, loosely-filled sand-bags, weighing three pounds each, were placed on the front aspect of the thighs and held there with a few turns of a roller bandage. The foot of the bed was elevated about eight inches. When the cord was perpendicular the scales showed a weight of fourteen pounds, with the sand-bags. When the bed was moved so that the pull on the scales was nineteen pounds, or an increase of five pounds net, the rope was at an angle of about twenty-five degrees.

Having to leave the city at the end of two weeks after this, I visited this boy every other day during this time, and instructed the doctor constantly in the management of the splint and gave instructions to the mother, who was also nurse, as to managing with the bed-pan and changing the bed, etc. As the callus was being formed and the limb was straight, before I left, I put on well-padded, heavy plaster casts as an added safeguard and, in lieu of the sand-bags, to add weight to the limb. Hand-holds were placed at the head of the bed and the patient was instructed to keep himself pulled-up in the bed. This, however, is always a superfluous command as they always do so in seeking their own comfort.

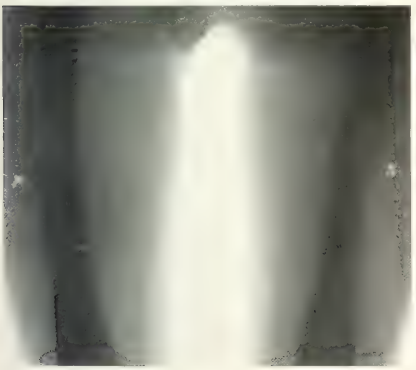

Fig. 10. Case 2. Paul D., aged seven years, fell from a tree on his feet and fractured both thighs about the middle third. Treated with two Hodgen splints. Limbs exactly the same length. Skiagraph taken six months after injury.

Fig. 11. Case 3. A. S., aged eighteen. Had fracture of left thigh in middle third nine years ago at the age of nine. Hodgen splint. No shortening or deformity. Side view. Antero-posterior view does not locate the site of injury.

I next saw this boy three months later, and his mother informed me that the doctor did not touch either splint until four weeks after my departure, when he took both of them off, and that two weeks later the patient was walking about as well as ever. The skiagraph shows the antero-posterior view. A fluoroscopic side-view showed as little deformity but unfortunately we did not think it necessary to take pictures of them. The limbs are the same length.

Case 3. (Fig. 11.) Is that of the thigh of a young man, now 18 years old, whom I treated when he was 9. At the time, his limb was so light I extra-weighted it by slinging a coupling-pin to the underside of the hammock. He was very unruly and flounced about over the bed at all times; but the suspended limb accommodated itself to his every movement, and he was entirely powerless to get it out of fix. I hunted him up two months ago (Nov., 1907) and had an anterior skiagraph taken. It showed no defect whatever in the line of the bone, and we were so sure we had taken the wrong limb that we sent for him again to come in from the country, when we got this side-view by which one is barely able to locate the seat of the fracture. A picture of the other thigh showed a normal bone. There is absolutely no shortening.

Case 4. (Fig. 12.) J. W., aged 35, was treated in my hospital, April 4, 1901, for simple fracture of the right femur at the junction of the middle and upper thirds; and was discharged May 21, 1901. During the seven weeks he

Fig. 12. Case 4. J. W. Simple fracture of middle third, eight years ago. Skiagraph of two weeks ago shows perfect result, and patient claims limb is longer than before.

was under my care, I am sure he did not require my attention more than ten minutes a day on the average, including the fifteen or twenty minutes it took to fix it up at first and the same time spent in giving him one only entire change of dressing so that his limb could be bathed and a clean hammock applied. During these seven weeks he required very much less attention from the nurses than a patient with a sprained ankle would. He sat up in bed the greater part of each day after the first week. He read and wrote, bathed himself and used the bed-pan without assistance, and as the weather was warm he frequently got over on another bed, rolled alongside, while his bed was turned and freshened up. He had no discomfort of any kind after the first week of his confinement. Measurements, gait and skiagraph, taken seven years after the injury, all show a perfect result. This patient is the only one I have had who says his limb is longer than it was before. Theoretically this is possible as muscular resistance is the only cause for shortening in that it prevents the over-lapping being pulled out. If the muscles should be so stretched that the over-lapping would be over-corrected and under-lapping exist, the bone would actually be longer.

Case 5. W. H., aged 65, treated by Dr. McAdory, in 1903, for fracture through the great trochanter which was demonstrated under chloroform, and loaned to me in November, 1907, for X-ray purposes. The doctor gives me the history that there was eversion and two inches shortening; that he was treated for eight weeks with my Hodgen splint, and remained in perfect health and comfort during the whole time; which the last patient corroborated. He was walking about again in twelve weeks, and had never had any stiffness of the knee or hip and no bed-sores. No shortening is to be detected at this time.

Case 6. Fig. 13. J. L., aged [illegible], was thrown from a horse and had his left hip broken in September, 1906. I saw him in consultation with Dr. C., two miles in the country. Ether was given and the diagnosis made of fracture through the great trochanter. The limb was three inches short and in complete eversion. Three hours later we swung his limb up in the Hodgen without ether and without hurting him. I visited him every day for a week, adjusting a pin here and a block there, until he was entirely comfortable and understood how to keep himself so. This he informed me was by keeping himself pulled up in the bed and so to place his body that the rope would pull his leg slightly away from the other one, which happily was also the best possible formula for the welfare of the limb. After the first ten days I did not go back to see him for three weeks, supposing Dr. C. was attending him. I found that no one had touched it since I had been there. All this time he had moved about in bed as he pleased and had been entirely comfortable. I found the splint in good condition and still doing its work perfectly and automatically, as was to be seen in the absence of eversion and shortening. There was such a great falling away of the muscles and fat in the region of the trochanter that I could satisfy myself fully that the fragments were in good position and could feel that there was a very small amount of callus, which is another evidence that the fragments are well approximated. I lowered his limb to the pillow and took every thing off; and while I pinned on a clean hammock-cloth, his wife bathed and rubbed his limb. The adhesive strips had not been made double and had stretched somewhat but, otherwise, the changing was not necessary, except for the freshening up it gave him. This was the only time the splint was changed in the eight weeks, and this took about fifteen minutes without an

Fig. 13. Case 6. J. L., aged thirty-five, was thrown from a horse and fractured right thigh through the trochanter. When first seen, foot was in extreme eversion and the limb was three inches short. Fracture diagnosed and demonstrated under chloroform but not with X-rays. Above taken one year after injury. No shortening what-

Fig. 14. Case 8. Badly combined fracture of middle third, thirteen days after injury. Strong traction being made and limb being held as straight as possible while skiagraph was taken.

assistant, the union being firm enough for me to hold the foot up with one hand and slip the splint under with the other; the rest of the procedure being merely to tie the traction-strips through the distal loops to fix the limb in the splint, looping the four cords over the hook of the scales, elevating the whole by means of the large tent-block and rolling the bed to its proper position and elevating the foot again on its blocks or bricks. This case well illustrates (what I have seen too often to recall all of them now) that if this apparatus is put up substantially in the first place, and the foot of the bed sufficiently elevated to prevent the patient slipping to the foot in spite of himself; above all, if he is looked after attentively the first few days until the muscular spasm is controlled, and he is shown that the best thing for his limb is that which makes him most comfortable, this splint comes very near to being indefinitely automatic in its action. This skiagraph shows such a perfect result that one might doubt there had been a fracture, if the line of union could not be plainly seen running from the surgical neck through the great trochanter to below the lesser. This man had no stiffness of the hip or knee, and was walking well by the sixteenth week without a cane and without a limp. He has no shortening whatever: and when I saw him six months later I could not tell which limb had been injured, or that he had ever had an injury at all.

Case 7 is the final skiagraph of a man aged 30, who had a bad simple comminution of the thigh.

Case 8 (Fig. 14) is so much like Case 7 in history, course, and results, that I shall report them together. Case 7 was treated by Dr. Torrance and case 8 by Dr. Whelan and myself. These cases should not be reported as having been treated with the Hodgen splint; and I report them only as examples of "how *not* to do it." They were treated according to my recommendations in every particular, except that the hospital management would not allow a pulley-wheel to be put in the ceiling and would furnish no suspension-frame, except a very unsteady one that allowed of a suspension-cord only two feet long. I had heard repeatedly that the results at this hospital were not entirely satisfactory as to shortening, even while it was common practice to have the spring-scales showing a greater pull than I was in the habit of using. Being permitted to visit No. 8 frequently and practically take charge of his treatment, I satisfied myself perfectly that an adequate pull cannot be applied with a cord only two feet long. The greatest pull I could effect was twenty-five pounds. This was pulling almost horizontally; was very irksome; restricted the patient's movements to nothing, and invariably pulled his foot down against the foot of the bed, and still did not reduce the shortening. These conditions more nearly represent the stiff, uncompromising pull of the Buck's than the free and comfortable swing of the Hodgen. These patients have fairly good results. No. 7 is said to have no shortening; but the skiagraph undoubtedly shows that he has some, while I know that No. 8 has nearly an inch. Had these two cases been treated in their homes, with a long suspension-cord so that the patient's body-movements would actually increase the efficiency of the eight or ten pounds pull, giving that rocking teasing motion, I feel sure the results would have been much better. In fractures badly comminuted like these, a heavy plaster dressing should be applied from the knee up to the perineum to aid the natural splinting action of the tense muscles in forcing the fragments back in place. I mention these last two cases only to show the importance of the long suspension-cord: and that the more this cord is shortened the nearer the principle of extension approaches the principle of the Buck's extension, which it has been one of the main objects of this paper to explain is not the proper principle.

Another patient, R. D., aged 14, hurt in a football game in November, 1905. He was treated for a sprain of the knee until two months later, when the X-ray revealed a backward and outward fracture-dislocation of the knee. In June, 1905, I operated for the reduction of the deformity which was causing him to walk with a very bad flexion-valgum limp. The condyles or lower fragment had become firmly united to the posterior edge of the fracture surface of the shaft, and to a mass of new bone that had formed under the stripped-up periosteum of the under side of the shaft. This union was chiseled through and, then by sacrificing a thin plate of bone from either fragment, the reduction was effected and the fragments sutured with one heavy silver wire, as shown by skiagraph No. 20, taken eight weeks afterward. The operation was done without opening the joint, the wound was closed with silk-worm gut and a small drain of the same, and the limb put up in the Hodgen without extension. There was some infection and suppuration; and the wound had to be dressed daily for a week or two. By having the knee portion of the hammock a separate piece, this was unpinned and turned back making the dressing a very easy matter for one person with no assistance, except that given by the thigh and leg portions which supported the limb while the dressing was done. This patient suffered little or none and was out in eight weeks with a perfectly

Fig. 15.—W. G., aged 30. Compound comminuted complicated shattering of the condyles of both femurs; knee joints torn widely and filled with mud; both patellar tendons cut through. Cleansed, repaired, and swung up in Hodgen splint.

straight limb and one inch shortening, due to loss of bone and growth in the epiphysis.

One case of compound fracture of the femur, with severe infection and sloughing, in which from first to last more than twenty incisions were made in the thigh and gluteal region, the whole septic period lasting four weeks, was finally saved with one inch shortening due to loss of a fragment of bone. In this case, large hot wet dressings were applied every four or six hours, frequently by the night nurse alone. In doing this the limb was elevated by means of the large tent-block and pulley, and a large douche-pan was slipped under the buttocks. With the thigh-half of the hammock unpinned and turned down, the upper portion of the splint would tilt up out of the way and the leg portion of the hammock supported the whole limb while the dressing was applied.

Photograph 15 is that of a man who sustained compound comminuted fractures of condyles of both femurs, both so extensively shattered they could not be wired, patellar tendons cut across and both knee-joints torn widely open and ground full of mud. By having the hammock in three pieces and turning back the knee portion, the wet dressings could be so easily and frequently applied that this patient never had any septic absorption at all and recovered, in part, with one stiff limb and with some motion in the other. The latter limb was inadvisedly amputated nearly a year later, however, on account of continued suppuration of the shattered condyles.

Lastly, I have two old lady patients, eighty years of age, whom I treated six and ten years ago, respectively for fractures of the hip. Neither of them had any stiffness of the knee or hip; and both have been walking about ever since, with no apparent shortening. Both are too feeble now to leave home to have their skiagraphs taken.

A few other cases, I might have presented from the practice of my surgical friends and said to be good results, were open to the objection I have dwelt on above, i.e., a very important principle had been neglected or ignored; and I did not consider such cases as fair examples of the method.

After using this splint for more than twenty years in its gradual modifications and giving it a good deal of thought in that time, I am now inclined to believe and make this seemingly radical statement, that there is no simple fracture of the thigh that cannot be successfully treated with it, and that it is never necessary to do an open operation in a recent case.

If the details of the method I have described are carried out, the results should be perfect in nearly if not all cases, and the amount of attention required from surgeons and attendants will not be one-fourth that of other methods. If it is put up in a slovenly manner, it will not be substantial, the work will be annoying and the results may be anything.

The greatest difficulty is, that accurate attention to the details is not given. While these are not at all difficult nor complicated, they do not *seem* to be of much importance and are often slighted by the beginner when they are really vital to the success of the whole. If a tent-block slips or splits, the cords of traction-strips stretch, the pulley pulls out of the ceiling or the bricks supporting the foot of the bed tumble over, the operator with any mechanical bent at all will be able to locate the defect and remedy it without getting discouraged to the extent of abandoning the experiment altogether.

One of the leading surgeons of the country began an article on fractures a year or so ago, by saying (in effect) that after a very large experience in accident surgery he still approached the treatment of fracture of the thigh with much misgiving. In contrast to that, I have to say there is no fracture in the treatment of which I am so confident of

getting a good result. By a good result I mean: the patient made comfortable, a minimum amount of work for the surgeon and attendants, no bedsores, the patient retaining a good muscular condition by reason of the great amount of liberty of movement and exercise he gets while under treatment, never any stiffness of the knee-, hip- nor ankle-joints, the quickest union and shortest convalescence, a straight limb, with no shortening and with never a non-union.

I am perfectly willing to be thought radical, even absurd by some, if I can induce a competent and influential surgeon here and there to carefully investigate the matter. The subject is certainly of importance, when it is admitted on all hands that, so far, the treatment of this fracture has not been satisfactory even in the best hands in the best hospitals; and interest should certainly not be taken from it, when I assert that it is being treated most successfully all over this part of our state; in log cabins by country friends of mine, and in the large contract-work of the mines in this district; as well as by all except one or two of the doctors in our city. I think any one can use it who has mechanical eye enough to see how the weight of the limb is used to make the extension. The rest lies in understanding the importance of putting together properly and substantially what, at first sight, seems a sort of childish plaything, and retaining one's patience until one masters the slight art to adjust the safety-pins, cords and tent-blocks, the angle of the suspension-rope and the position of the bed, until the patient is comfortable and the limb is being pulled sufficiently and in the proper line.

SIMPLE HYSTERECTOMY IN SIMPLE CASES[1]

BY ALEXANDER HUGH FERGUSON, [illegible]

In presenting a description of a simple operation for hysterectomy, allow me to picture a typical case in which it is indicated.

A woman, aged about 40, suffering from fibroids of the uterus of such dimensions and number as to destroy all functional activity of the body of the uterus. The ovaries and Fallopian tubes are normal. Simple or multiple myomectomy is out of the question. The cervix is either normal as in a maiden, or sufficiently in a healthy condition as not to be removable from a functional, anatomical or pathological viewpoint. Even when the cervix is not conservable, the principles of the "simple hysterectomy" should in many instances be practiced. Indeed from a case with a comparatively limited pathology to the extreme conditions where the possibilities of this operation being performed, the indications widely vary according to the capabilities and knowledge of the man behind the knife as well as to the conditions encountered.

As a rule the vagina and cervix uteri should be rendered surgically clean. When the hymen is intact and there has been no history or signs of infection this is not necessary.

1. Leave the cervix.
2. Leave the ovaries.
3. Leave the tubes.
4. Leave as few absorbable sutures within the abdomen as possible. Never use silk or linen or cotton material for sutures.

OPERATION

Prepare, anæsthetize, and laparotomize the patient. Drag the pathologic uterus out of the abdomen, protect the omentum and bowels with moist gauze pledgets of suitable size and thickness. Crush the broad ligament close to the uterus on both sides. The instrument used for this purpose must be very powerful and, if possible, the uterine artery is included in its bite. Remove the clamps and insert No. 2 chromic catgut and forcibly tie it in the crushed track on each side. As an additional precaution against slipping of the ligature, one of its ends may be passed under the round ligament externally and tied to its fellow on the inside. Apply a strong crushing forceps proximal to the ligature on the broad ligament on each side and cut between them. Fig. 1.

The forceps prevent bleeding from the uterus and growths, while the ligatures produce hæmostases from the vessels in the broad ligament. A separate ligature (No. 0 chromic catgut) may be applied to the cut vessels distally as an additional permanent security against hemorrhage.

Amputate the uterus above the cervix (Fig. 1 and 2), leaving fore and aft liberal flaps. Rim out the internal os uteri, and in women who have borne children or when the mucose of the cervix has been curetted, pack formidin or iodoform gauzes into the vagina from above downwards. On threaded, strong, round needles, pass the ends

[1] Read before the Chicago Gynecological Society, February 21, 1900.

of the ligatures from the broad ligament stumps through the base of the flaps of the cervix on each side of the cervix (Fig. 2), tie them and sew the flaps of the cervix over the broad ligament stumps with two or three interrupted sutures (Fig. 3), or by a continuous suture, which completes the operation with the exception of closing the abdominal wall.

It is often necessary for perfect coaptation to employ both deep and superficial sutures. For this purpose one suture may be inserted, one portion passing deeply and the other superficially as in Fig. 2. This double function (superficial and deep coaptation of the structures) of one piece of catgut has a wide range of application in surgery. It is my favorite method of closing the muscle and fascia of the abdominal wall. Either continuous or interrupted suturing may be employed with equal facility.

The conditions that vary in different instances demand a variation in the technique of the operation, which of course any surgeon does according to his own sweet will, but the objects aimed at must stand inviolate. These aims are:

1. A minimum number of sutures.
2. A minimum amount of raw surface.
3. A prevention of prolapse of the cervix and vaginal vault.

I have performed this operation fifty-two times without a death or complication, and without any dissatisfaction to the patient.

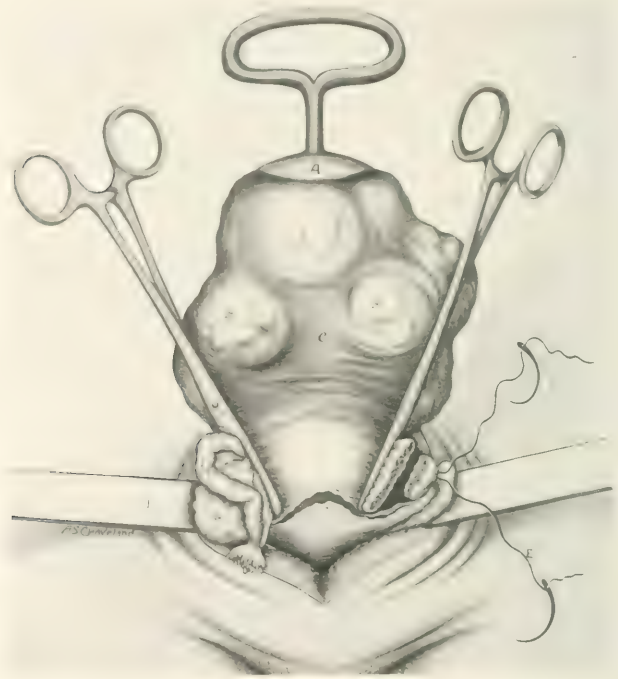

Fig. 1. *A*. Corkscrew. *B, B, B*. Fibroids. *C*. Uterus. *D*. Clamp. *E*. Ligature tying off broad ligament and vessels. *F*. Fallopian tubes. *G*. Ovaries. *H*. Vesical peritoneum reflected for supravaginal amputation of uterus.

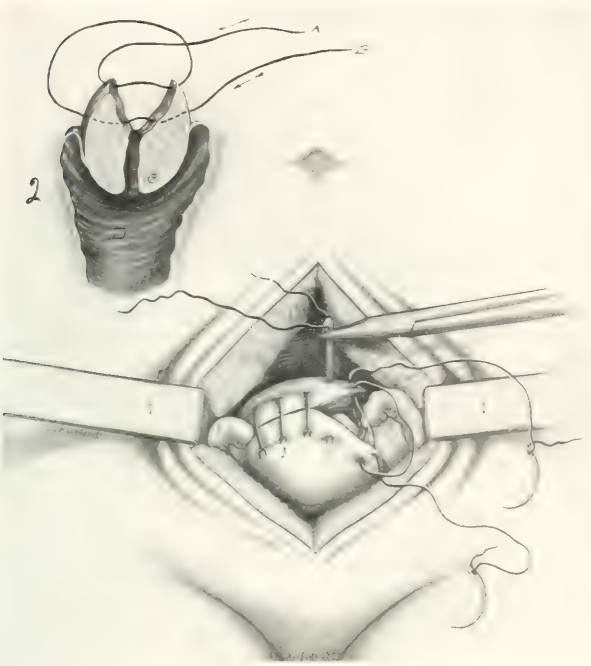

Fig. 2. *F, F.* Fallopian tubes. *J.* Stitches closing the stump. *I.* Retractors. *E.* Ligature tying off broad ligament and vessels.

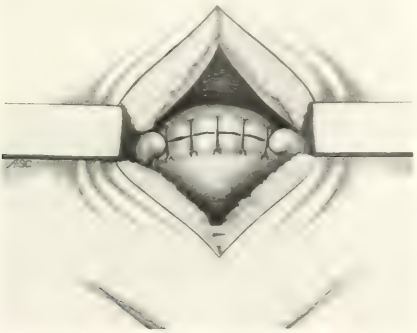

Fig. 3

TRANSACTIONS OF SOCIETIES

MEETING OF THE CHICAGO GYNECOLOGICAL SOCIETY, FEBRUARY 21, 1908

J. B. DE LEE, M. D., PRESIDENT.
FRANK W. LYNCH, M. D., SECRETARY.

EXHIBITION OF SPECIMENS

DR. HENRY F. LEWIS: This kidney is from a man about thirty years old, who entered my service in Cook County Hospital after having suffered a fall upon the right side. He was in a condition of shock and was acutely anæmic. There was found upon examination an area of flatness extending from the groin up to the liver and over to the umbilicus. He was in an extremely bad condition. The pulse was high, temperature only slightly elevated. I opened the outer border of the right rectus at about the level of the umbilicus, running an inch below, and about three inches above, and came down on this large mass, which was post-peritoneal, and consisted of this cystic kidney. Inside its capsule and outside in the fatty tissue around the kidney, was a large amount of clotted blood. It was evidently a rupture of some portion of the kidney. There was an immense amount of bleeding after the kidney was removed, in spite of ligaturing the vessels, so it was necessary to tampon the cavity. The patient survived only about twelve hours.

The interest is from a pathological standpoint, and consists in its being a multilocular cystic kidney. The other kidney was in a normal condition, as far as I could tell by feeling.

The second specimen came from a case where I performed supravaginal amputation of the uterus for a large cystic myoma of the posterior wall.

A large mass lay within, and connected with the uterus, and as large as a full-term fœtal head. At the time of operation, three-fourths of a pint of bloody serum was obtained by the trocar through this thick-walled cyst. There are several small fibroids in the uterine wall, one to the left of the fundus about as large as a walnut. I took this tumor to be an ovarian cyst, probably a dermoid. At the examination, the cervix was quite long and this, the fundus, appeared to be distinct from the tumor. On opening the abdomen, the first thing that came into view was a pair of fairly large hydrosalpinges. Each has diminished at least 75 per cent in size from immersion in the preservative. They were about 4 inches long and 1½ inches in diameter. They came up into the wound and I removed them first, then tapped the uterus with a trocar, and obtained three-fourths of a pint of bloody serum. The woman was 45 years old, was still menstruating rather normally, but had noticed for the last two years a gradual growth in the abdomen. There was no sudden growth at any time. I had some slides made, but they are not in a condition to use. They show a specimen taken from the wall of the cyst, apparently granulation tissue on the inside and ordinary fibroid structure, with nuclei staining very slightly. Probably the hæmorrhage was the starting-point of the cyst. There is no sign of sarcoma.

DR. J. B. DE LEE: Three weeks ago Sunday, a patient entered the Lying-in Hospital, at the eighth month of her third pregnancy. She had felt very well up to the morning of her admission. She says she always menstruated very profusely, and her general appearance before this time had been one of more or less anæmia. Sunday morning she had a severe pain on the right side, low down near the appendix, which, however, did not prevent her from pursuing her housewifely duties. She was compelled about noon, on account of excessive pain, to go to the hospital, and on arriving there was in a state of shock and anæmia. Her respiration was sighing, pulse very weak, but not fast. The pallor was extreme, and external hæmorrhage had been going on for an hour or hour and a half. Fœtal movements had not been felt the morning she arrived at the hospital. Owing to untoward conditions, help did not reach her until 4 o'clock. When she arrived at the hospital about one P. M., she was examined by a physician who happened to be present, and when I arrived at 4 o'clock, the patient had rallied somewhat from her first hæmorrhage and was resting fairly well, but complained of intense pain in the abdomen and more or less exhaustion. Examination showed the uterus very much distended, as large as a nine months; pregnancy, in a state of constant contraction, the walls tense and

very tender, especially on the right side low down, but there was no irregularity. Vaginally, blood was escaping in a continuous stream. On internal examination, the cervix was found partly effaced, admitting two fingers, rigid, and very high up in the hollow of the sacrum. A diagnosis of premature detachment of the placenta was made, and the patient put on the table for vaginal Cæsarian section. The pulse had gone up in rapidity and had not decreased much in strength, although it had very small volume. The yawning had recommenced and the patient was in a critical condition. The vaginal Cæsarian section was attended with unusual difficulties. It was impossible to bring down the anterior wall of the uterus; it was impossible to bring the cervix down to the vulva, or anywhere near it, even after the transverse incision had been made in the usual manner. When I attempted to bring down the anterior wall of the uterus by the vulsellum, a piece of the uterus pulled out. The blood coming from the uterus itself, plus the blood flowing from the wound of operation, interfered very much with the incisions; it was almost impossible to see anything, and the wound itself bled very profusely, confirming our suspicion that we we had to do with a woman of bleeding tendencies. It was necessary to complete the operation under the guidance of the fingers, by touch, which was accomplished and the baby extracted up to the head. It being dead, a perforation was made in the skull, the cranium emptied, the placenta delivered, and the whole genital tract tightly tamponed. The woman became pulseless on the table. I forgot to mention that the entire operation was done without an anæsthetic, owing to the woman's extremely grave condition. While she made some noise, she remained perfectly quiet, appreciating her condition. After packing the uterus, we gave the woman salt solution by the rectum and hypodermically. The amount of salt solution is of considerable interest; she received two quarts and a pint per rectum and two quarts and a pint by the skin, and rallied so that she was in pretty fair condition when I left. At midnight she began to get worse, the pulse disappeared, and she got two quarts more, making a gallon by the skin, and another quart per rectum. When I arrived at two o'clock the woman had not rallied sufficiently, so I gave her another quart and a pint per rectum. She received a total of a gallon and a pint through the skin, and a gallon and a pint per rectum. She retained all this salt solution, and it seemed to keep the pulse going. She lost consciousness after 9 o'clock, lost all knowledge of her surroundings and paid no attention to her treatment until 6 o'clock, when she awoke, claiming she had slept all night. At 3 o'clock the oozing had recommenced, so I injected into the gauze a two per cent solution of gelatin and packed the vagina very tightly with cotton soaked in gelatin. There was no hæmorrhage after this, the patient became fully conscious, and while she was completely blanched, has made an uninterrupted recovery.

The points of interest are: 1. The difficulty of drawing the cervix down so it could be reached in the usual operation of vaginal Cæsarian section; 2. The friability of the cervix; 3. The hæmorrhage from the tissues themselves; 4. Hæmorrhage from the interior of the uterus; 5. Old hæmorrhage blocking the operation, which was done under the guidance of two fingers; 6. The immense amount of salt solution administered. Another point; in the first twelve hours after the operation only one ounce of urine was passed, and that nearly solid albumin, and in the next 12 hours ten ounces were passed, making 11 ounces in the first 24 hours. Possibly it was due to the action of the salt.

The other case was acute toxæmia in pregnancy, with threatened eclampsia, with all the urinary indications that go with such a case: albumin, blood, casts, red and white blood cells, a retinitis gravidarum, or rather retinitis albuminurica, severe headache, all the symptoms of an impending eclampsia. In this case, a pregnancy of eight months was also found and a vaginal Cæsarian section was also done. The cervix was about the same size as in the last case, admitting two fingers and partly effaced. This woman was a primipara. In this case the cervix was easily brought down to the vulva, the vaginal hæmorrhage was not to great and the operation was completed in the usual way, without any trouble whatever. As soon as the placenta was delivered the woman began to bleed, not alone from the uterus but from the incisions. It is curious, and I do not quite understand why we were not troubled more with hæmorrhage during the operation. The amount of blood that came from the incisions was not much more than usual; but when it came to sewing up the peritoneum; the oozing was troublesome and was stopped only by tamponing. In removing the tampon the next day, the hæmorrhage recommenced from the abraided surface of the vagina and in the incisions of the uterus, so it was necessary to tampon again. This woman gives a more accurate history of a bleeder. She says a tooth extracted gave a great deal of hæmorrhage; when she cuts her finger, it takes a long time for the hæmorrhage to stop, and she also has a profuse menstruation of eight to ten days. This woman also made a satisfactory recovery, but the child died from an acute intestinal affection.

Dr. De Lee: Dr. Bacon, have you met with difficulties such as I have described?

Dr. Bacon: No, I have not. Have you any idea why you had difficulty in pulling down the uterus?

Dr. De Lee: I have not the slightest idea why. (Illustrating) There is the sacrum, there is the pubis: the cervix was away up there, and it would not come down. The woman had no history of difficult labors, and no tumor, no adhesions of the uterus, but it was impossible to bring it down. I did not use a long speculum, but a short one which did not go in farther than that, so there was no long speculum to push the cervix up into the hollow of the sacrum. She was a multipara, and one would expect the cervix to come down easily. The next case was a primipara, and the cervix did come down easily. I would also like to get an expression as to the hæmophilic tendencies of the case.

Dr. G. Kolischer: In the first case that Dr. De Lee reported, it is rather questionable whether vaginal Cæsarian section was indicated. The essayist himself reports that it was impossible to pull down the cervix, so that he had to operate entirely led by his sense of touch. Now to make a Cæsarian section entirely in the dark is not an ideal procedure. The indication for it becomes even less understandable, if we consider that at the time of his interference the child was already dead. It would seem that bloody or unbloody dilation of the cervix, and embryotomy would have suggested themselves.

As to the second case, I would like Dr. De Lee to explain what he understands, or rather what we should understand, under the term that he uses, that a patient is threatened with eclampsia. Eclampsia, so far, is not a well-defined pathological entity, and a clinical picture only. There are no characteristic prodromal symptoms that would indicate that eclampsia has to be expected. With the same right I could say that every woman, provided she is able to conceive, is threatened with eclampsia, but how are we going to diagnose eclampsia in advance. To base an indication for operative interference on such vague premises does not seem rational to me.

As to administering excessive amounts of saline solution, I would be rather afraid to overburden the heart, and would prefer to use smaller quantities of saline solution with a few added drops of adrenalin solution, — a procedure which has repeatedly been proven to be an excellent means of tiding a weak heart over a critical period.

Dr. Henry F. Lewis: I question the necessity for these forcible deliveries in the cases of eclampsia, or nephritis, or toxæmia, especially a delivery so forcible as that by vaginal Cæsarian section. We know that in a great many cases of eclampsia, or of toxæmic symptoms, the patient recovers after the puerperium or gets better after the child dies; and are we justified, except in very rare cases, in going so far in forcible delivery as to do vaginal Cæsarian section, especially where the operation is attended with great difficulty? In the first case there was difficulty in doing the section; in the second case there was a history of hæmophilia; and in either case it was evident that operation would be difficult and dangerous. Fortunately, I have never had to do vaginal Cæsarian section, but I remember one very interesting case at the County Hospital where I was prepared to do it, got all ready, but on examining, found that cervix dilated without trouble. That is the only case where I have been tempted to do this operation. I wish Dr. De Lee would dilate a little on the point as to what cases are so bad in regard to toxæmia as to demand such a serious operation as vaginal Cæsarian section. And why vaginal, in preference to abdominal, section?

Dr. Rudolph W. Holmes: Some experiments carried out in the laboratory of the College of Physicians and Surgeons of New York by Dawbarn some ten years ago, and substantiated later by others, showed that in cases of hæmorrhage it was necessary to give nearly twice the amount of saline solution as the estimated amount of blood loss, in order to get the full effect. If, for example a woman loses two quarts of blood, to carry out the recommendations suggested by the experiments, four quarts of the solution should be given. It is self-evident that the term "bleeding to death" does not literally mean that all the blood has escaped from the vessels: approximately only half of the total blood may pass from the circulatory system in deaths from hæmorrhages; the anæmia superinduces vasoconstrictor paralysis; the resultant enormous vessel dilatation means partly empty vessels. The salt solution is given with the purpose of filling the vessels with diluted blood until the hæmatopoietic function is fully re-established. I have had eight, if not more, severe cases of ablatio placentæ, and find that the amount of blood which escapes before or during delivery bears but a small proportion of that which has entered the uterus; where the presenting part is above the girdle of contact the large losses of dead blood escaping from the genital tract may be very disconcerting. I am convinced that vaginal Cæsarean section should be carried only out when the field of operation may not be obscured by bleeding from the uterine cavity — to attempt the operation, when the incision must be made blindly.

is nearly folly. I am further convinced that manual dilatation is the most appropriate method of dilating the os in ablatio placentæ, for the tactile sense alone need be considered.

About adrenalin: It has been shown by experiments that to give a few drops of a 1—1000 adrenalin solution merely raises arterial tension momentarily. The only logical way to give adrenalin in hæmorrhage cases is to give *slowly* a very dilute solution; by this means the pressure is continuously raised until reaction sets in.

Dr. Preble told me of a man sick with pneumonia; he was in extremis and death was momentarily expected. He was given an ordinary full dose of adrenalin — with a bound, the pressure rose, and almost at once it again fell to almost, if not to, zero.

Dr. Charles S. Bacon: I think these are very interesting cases and bring up some valuable points. The recital of the first case impresses me with the importance of the salt solution injections. Probably nothing else would have saved this patient. A woman of average weight has four to five quarts of blood, about one-thirteenth the weight of the body. We know that it is a very serious matter for any animal to loose half the blood in the body. I should judge from the report that nearly half the blood of the woman was lost in this case, and the filling of the vessels, the keeping up of the circulation pressure by the injection of salt solution was absolutely necessary. I doubt very much whether anything else could have saved her, and this management fortunately justified itself in the results.

I have taught that a vaginal Cæsarian section, *when it could be performed*, was the ideal management of cases of detachment of the placenta when the cervix was so closed that dilatation was impossible. I presume, in this case the operator concluded that it was impossible to dilate sufficiently to reach the child. If the cervix can be dilated and craniotomy done, that will save a certain amount of traumatism and perhaps of blood; but when dilatation and immediate delivery is impossible, one must make a Cæsarian section, or rely on the tampon. It can be done ordinarily in a short time and with a saving to the patient. So I should be inclined, not knowing or anticipating beforehand that there would be difficulties in the operation, to take the same procedure that was done here, and I am not sure that this case would change my opinion in similar cases in the future.

As to the second case, nothing was said in the report about prophylactic measures, and I believe these should be taken. I am inclined to assume that they were taken here. A patient with such symptoms as those described is in an extremely toxic state, and I see no objection to the statement that the patient is threatened with eclamptic seizures. She is in an eclamptic condition, but whether the seizure will come or not we cannot say, but there is danger. If she is treated with elimination, perhaps, or other methods, for a few days without results, then certainly some way of emptying the uterus is indicated. Whether it should be a slow delivery, the introduction of a bag, rupture of the membranes, or whether it should be section, must be determined. Which is the most conservative, is the only thing. It is rather probable that the rapid emptying of the uterus would give a greater chance to the child, and the rather long induction of labor would perhaps be as harmful to the mother as the rapid emptying of the uterus by vaginal section. I believe vaginal section is very much less shock than abdominal section; so, in spite of the complications in these two cases, I should be inclined to try the same procedures.

Dr. G. Kolischer: As to the remarks of Dr. Bacon and Dr. Holmes, I would like to say that they tried to refute statements that were never made. I never said that pure adrenalin solution should be administered to the patients, but I suggested, as it is very well known in the surgical world, the addition of a few drops of adrenalin solution added to the saline solution; Dr. Holmes evidently overlooked the publications referring to that. That the mere introduction of the fluid into the body in large quantities is not the only saving factor, was proven twenty years ago by the experiments conducted by Maydel.

In regard to Dr. Bacon's remarks, I never claimed that the rapid evacuation of the uterus in eclamptic cases was not the proper procedure; on the contrary, some years ago we had a discussion on eclampsia and its therapy before the same society, and I, basing my statements on large statistics, advocated this energetic interference in eclampsia. In this point of view I was strongly opposed, and one of the leaders of this opposition was Dr. De Lee. To-night, I simply said that I could not approve of doing a vaginal Cæsarian section before the diagnosis of eclampsia is made. The diagnosis of eclampsia is based on certain clinical features, that is, if a pregnant woman, or a woman immediately after the delivery, is seized by convulsions that are accompanied by loss of consciousness, and rise of temperature. So far, nobody has succeeded to prove a definite connection between nephritis and its clinical emanations and between eclampsia. On the contrary, the most experienced obstetricians admit that nephritic

patients very rarely, or almost never, are seized by eclampsia, while they know of lots of cases in which eclampsia occurred without any signs of nephritis.

I would like to call attention to the modern theories for explaining eclampsia, which all consider the circulation of toxines, the appearance of which is not dependent on the co-existence of nephritis. I therefore cannot say that I am convinced that even Dr. De Lee, with all his experience and all his decisive ways, is able to divine an eclampsia some time ahead. While I admit that a vaginal Cæsarian section is a valuable operation in its proper place, I cannot approve of the indications that Dr. De Lee propounded for it to-night.

Dr. J. B. De Lee, in closing the discussion, said: Many points have come up that are certainly discussable. First, is it possible to foresee an eclampsia? I think it is not alone possible to foresee eclampsia, but that it is actually demanded of the obstetrician to foresee eclampsia. The eclamptic convulsion is simply one symptom of the so-called eclamptic state, and when we see the eclamptic state beginning and advancing in spite of treatment, it is reasonable to suppose a convulsion is the next sympton to be expected. If you will take the histories of all eclampsias and study them carefully, you will see that œdema, headache, ocular disturbance, muscular twitching, disturbance of the nervous system, disturbance of the sense of smell, taste, hearing, etc., almost invariably precede the convulsions. Also, examination of the urine will show a decrease in amount, with the presence of albumin, casts, and blood — all the signs of acute nephritis. I am perfectly aware it has been said that eclampsia may occur without these premonitory symptoms, but in 58 cases that have come under my observation, not a single one has occurred without plenty of warning in the way I have described. I am aware eclampsia may occur without renal findings; Ingersoll is said to have quoted 108 cases. Jaggard, who had an immense experience, always doubted the accuracy of Ingersoll's cases. In my own experience there was only one without renal findings. These things, in my experience, are true: When a woman begins to develop the symptoms of an eclamptic state and has evidences in the urine, I think it is perfectly reasonable to say she is threatened with eclampsia. That one can say a woman has eclampsia only when she has a fever, is too narrow a view of the subject, because a woman can have eclampsia, and die of it, without having fever. It must be admitted, however, that most cases do have fever. Eclampsia is not a distinct entity, it comprises several conditions. I believe it would be a very unfortunate dictum to go out from this society that eclampsia is only eclampsia after convulsions have occurred, and that no man can say a woman is going to have eclampsia unless she has it, because it will take the confidence of the physician away from his examinations of the patient and the urine, and will lead to carelessness and simply waiting for something to turn up. One of the most important functions of the obstetrician is to prevent eclampsia and allied toxæmias, but unfortunately he is negligent in his duty.

Regarding rapid delivery in threatened eclampsia, Dr. Kolischer admits that after a woman has had convulsions the proper thing is to deliver her. Jaggard in 1891 and 1892 said he had gotten better results from expectant treatment, or medical treatment, but later on changed his views and leaned more to active treatment. Statistics will show that the more rapidly the uterus is emptied after convulsions begin, the better the prognosis. Therefore, in eclampsia the delivery should be as rapid as is consistent with the safety of the mother. I believe it improves the chances of the mother and of the baby. If a man believes that eclampsia is on the verge of occurring, and rapid emptying of the uterus will tend to cure eclampsia, should he not rapidly empty the uterus, when eclampsia is threatening?

I agree with Dr. Bacon that the prolonged induction of labor — and some are very long, lasting two or three days — is more dangerous than a rapid delivery by cutting or other means, rapid dilatation, for example. Therefore, when eclampsia is feared, or if the woman presents a toxæmic state that indicates the imminence of convulsions, rapid delivery, to my mind, is the best way. I asked Dr. Bacon whether abdominal or vaginal section should be selected, and he says vaginal section in the marked cases. I selected vaginal Cæsarian section because I expected not to have trouble, and in the first case I met all sorts of trouble, but in the second case it was very easy. The post-partum hæmorrhage was easily managed, and the woman did not lose an excessive amount of blood. I would even say that in a special case where vaginal Cæsarian section was evidently going to be difficult in eclampsia, an abdominal section would be justifiable. As to cervical incisions, this woman's cervix was not dilated and admitted only two fingers. Incisions in this case would have been dangerous, especially as the cervix could not have been brought down for the scissors. The cervix was thick and only partly effaced. I perform cervical incisions where the cervix is effaced, but four cervical incisions are not much safer than a clean vaginal section. Vaginal section is quicker than

dilatation by the hand; I would also consider vaginal section safer than four incisions with subsequent craniotomy.

I have never used adrenalin in cases of hæmorrhage, I am waiting to get more statistical experience. I have used immense quantities of salt solution. Dr. Reed will remember a case of rupture of the lower uterine segment, in which the woman lost an immense amount of blood, was almost exsanguinated, where we packed the uterus and sewed the cervix together over the packing. We gave the woman a gallon of salt solution through the skin and she absorbed it rapidly.

In answer to Dr. Bacon's question as to prophylaxis of the threatened eclampsia, it was a consultation case, the woman had been under the care of her family physician for three weeks, getting worse all the time. Her principal complaint was severe headache, blindness, twitching of the muscles, and indications of a nervous explosion.

Just how salt solution acts I do not know, except that I believe it fills the vessels and gives the heart something to pump on. Given under the skin there will not be enough absorbed to load up the circulation, but, given in the veins, there is a possibility of overloading the heart.

It would have been much easier to have done an abdominal Cæsarian section, because of the difficulty of performing vaginal Cæsarian section at the ends of the fingers. I agree with Dr. Kolischer that it is difficult and dangerous, still the educated finger can do a lot, and it was possible, and not hard, to get the wall of the uterus between the fingers and feel the bladder and peritoneum, the peritoneum with the index and the bladder with the middle finger, and with the scissors cut between them. it was done safely, there was no injury to the bladder or peritoneum. I would not, however, advise that method of doing vaginal Cæsarian section.

Dr. Ferguson then read a paper entitled, A Simple Hysterectomy for Simple Cases.

Dr. A. Goldspohn: I wish simply to say that it is a nice technique, but it is a little too simple. I have always had an aversion, on theoretical grounds, to leave a useless tube, an organ lined with mucous membrane that will not obliterate but may continue to secrete. When I remove a uterus, I always very carefully remove such tubes completely. Not many cases will permit drawing the parts so far out of the body as these illustrations indicate; nor is it necessary in order to remove the tubes with the uterus with very little more care or labor. Then again, these woman are usually elderly women where we remove such uteri and tubes, and I do not think it is best to leave both ovaries. While there is no particular objection to leaving them, if they are perfectly healthy, still their secretory functions in elderly patients is a matter of lesser importantce, being sooner destined to cease anyhow; while on the other hand, neoplasms, sometimes of the malignant nature, may originate from such ovaries, in still later years. Therefore, it appears to me such a patient will be rather better off with one ovary, which answers every purpose for her than with two.

Dr. Channing Barrett: Simple removal for disease, is a very correct principle of medicine. Yet we cannot say this hysterectomy is more simple or less simple, because the tubes and the ovaries are allowed to remain. That depends upon the condition of the tubes and ovaries. If one chooses to leave them, or take them out, the operation can be made just as simple. I hardly think Dr. Ferguson bases the question of simplicity on leaving the tubes and ovaries. Clamping a broad ligament with one or two clamps and tying in one ligature, is not necessary. There are four places which we should ligate before we remove the uterus, the two ovarian arteries. and the two uterine arteries. We elevate the uterus, and with a small clamp, catch the ovarian artery, then go down the side of the uterus till we come to the uterine artery. We do not have to seize the whole of the broad ligament with one clamp, or tie the whole of it in one ligature. Another point: The use of an instrument that bores into the uterus, is rather risky, because every now and then we run across a cyst that has pus in it. I removed one not long ago with an instrument like that and let out pus in the abdominal cavity. We do not know when we are going into an infected uterine cavity, and there is no need of having an instrument that bores into the uterus.

Dr. G. Kolischer: Although it is rather hard to discuss an operation without having witnessed it, I think I understood Dr. Ferguson. that the main points that he claims for his procedure is, to put clamps on the broad ligaments before severing them, and that he afterwards draws the stumps of the broad ligaments together over the cervical stump. As to the use of the clamps, a method that was suggested years and years ago, I want to endorse it. If nothing else, the application of these large clamps prevents any subsequent venous hæmorrhage. As to the figure eight suture that Dr. Ferguson uses, I don't think that he claims any particular merit for that. Whether or not the drawing together of the stumps of the broad ligaments is able to prevent subsequent prolapse, is open for all kinds of speculation. I, for one, don't believe it. The statement that was made by one of the gentlemen, that a woman that lost the body

of the uterus is better off with one tube and one ovary than with both of these organs, does not sound rational to me.

Dr. A. H. Ferguson, in closing the discussion, said: I have very little to add. In regard to the corkscrew, though not under discussion, let me say that in my cases it was all right, and for Dr. Barrett's case it was all wrong to employ it. Notice that the corkscrew has a flange which, if screwed down, prevents blood getting into the field of vision, and, I presume, would prevent pus from escaping if there were sufficient hold on the tissue. I do not use the corkscrew in pus cases, nor do I then perform the operation now described.

The question as to whether the Fallopian tubes should be removed or not I have not touched on, and will not say anything about it, nor of the ovaries. I have taken it for granted that in simple cases of fibroids, if these were normal, we should leave them alone, the same as we leave the cervix alone, when it is normal.

The least amount of suturing is done by fastening the broad ligaments inside the stump of the uterus. The manner of securing the vessels I do not care anything about, but bringing the broad ligaments together in the center and fastening them in the stump of the uterus will raise the stump up and prevent prolapse.

A JOINT MEETING OF THE CHICAGO MEDICAL AND THE CHICAGO GYNECOLOGICAL SOCIETIES

FRANK W. LYNCH, M.D., Editor

A joint meeting was held, March 25, 1908, with Dr. Charles E. Paddock, Vice-President of the Chicago Gynecological Society, in the chair.

Exhibition of Specimens

LARGE GUMMA OF THE MESENTERY

Dr. Albert Goldspohn: We have here an unusually large gumma, much larger than I ever saw in any part of the body, that I was unfortunate enough to be asked to operate upon, and it was upon a mistaken diagnosis. A woman, forty odd years old, who had very marked external evidences of syphilis, applied for operation. Upon seeing her condition, I informed her that she ought to undergo a period of medical treatment before any operation should be attempted. She asked what that treatment would be, and I told her, and she said she would not have any more of that, as it had greatly disturbed her stomach, and that if I did not operate on her, that would settle it. In examining her, I found that she had a movable tumor in the small pelvis, which, from its contour, general characteristics, mobility, relation, and approximation to the uterus, I diagnosed as an ovarian cyst, or a neoplasm of some kind. When we came to operate on the tumor, however, it turned out to be this gumma, which grew in the mesentery of the small intestine pretty high up, and simply hung in the small pelvis. A part of the intestine, whose mesentery had been unfolded by the tumor, was constricted or narrowed; and the woman gave a history of rather unusual constipation. There were no other tumors to be found elsewhere. I could find no tumor or tumors in the liver, or anywhere else in the abdomen, and therefore concluded to take this gumma out, because it could be done. This I did, and made an anastomosis with the Murphy button, and the woman made a normal recovery without any complication or difficulty. She was in a feeble condition for a time, and did not leave our care for about four weeks, and then she was dismissed with strict injunctions to carry on an antisyphilitic, constitutional, medical cure. How long she did that, we do not know. In writing to the husband recently, I learned that she became insane nearly a year after she left the hospital, and some months later died in the asylum.

Microscopic sections have been made of this tumor, and show simply what we would expect in a granulation tumor. If there is any member who desires to see these sections, Dr. Cunningham will exhibit the slides.

MALIGNANT HYPERNEPHROMA

The next specimen is a large hypernephroma which is malignant, as the microscopic characteristics plainly show, and as the clinical history in the case also developed. Microscopic sections of the tumor portion have been made. The microscopic diagnosis was made by ourselves and confirmed in the Zeit Laboratory. The interesting things that we note in this specimen are these grayish-white islands of neoplastic tissue, found in the

sections of both these hemispheres, and particularly this large neoplastic mass at the end, the large end of these sections, which has very clearly crowded aside the normal kidney tissue, forced its way out, and also extended the pathological process to the tissues around the ascending colon, where I found indurations that were probably malignant, but could not be removed without injuring the ascending colon, and a more radical operation was not warranted in that depleted patient. The histological examination of this specimen does not show what we generally look for in hypernephroma, that is, a neoplasm into the renal vein. The authorities say that the metastases occur by the blood current, and that in the renal vein we generally find evidences of the extension. That was not found in this case, but the extension occurred by the tumor crowding aside normal tissue and encroaching upon the connective tissue about the ascending colon.

I may, perhaps, be permitted to allude to the most credited theory, in which the best authorities seem to unite, that the origin of these so-called Grawitz tumors are cellular, or are small remnants or particles of epirenal elements that are aberrant, have strayed into, or have become abnormally placed in the kidney, upon, or beneath, its capsule, and there grow and constitute sometimes malignant tumors, and sometimes not.

TUBOOVARIAN CYSTS

This other collection here is one of five tubo-ovarian cysts, in which the end of the tube that was severed from the fundus of the uterus is indicated by a pin introduced, and the abdominal end of the tube that enters into the lumen of the cyst proper is indicated by a stick of wood introduced.

The theory of growth of these cysts is also familiar to you. They are not such a remarkable thing any more, as they were some ten years ago. In the beginning, the process is one of inflammation, the result of infection, there being an agglutination of the open fimbriated end of the tube upon the ovary. If such an agglutination occurs firm enough, which we know can easily occur, and it happens that beneath this agglutination there is a follicle cyst, or the beginning of a genuine adenoma, then it can easily happen that the membrane covering that cyst and projecting into the lumen of the tube will perforate, and then we have a coalescence of the tumor cavity and the tube cavity, and the two together will then continue to expand and constitute the cyst wall or cystic contents — originally an inflammatory product, and later continuing to grow because of the continued formation of cystic contents.

EXHIBITION OF INSTRUMENTS

A PUERPERAL CURETTE

I have here a large loop curette, devised from the original French loop curette, such as we use in ordinary gynecological practice for uterine curettage. For a long time I have felt that, in dealing with puerperal cases, general practitioners have not been properly taught as students the difference between curettage in the puerperal uterus and curettage in the gynecological uterus. The ordinary gynecological curette, be it ever so efficient in the ordinary case, is usually a very disastrous and a very dangerous tool to use in the puerperal uterus. It is certainly a very nonsensical affair; it is, to my mind, like going into a bag lined with sheepskin with a buttonhook. Therefore, having such cases to treat and seeing such patients die in the hands of my colleagues (whose cases I have observed) within twenty-four hours after the use of these mischievous, small, ordinary curettes, I studied in regard to this matter; and my practice has been what is probably really the practice of most men, that for removing remnants of the placenta, the ideal curette of first choice is the finger, if it can be introduced, and it can be introduced oftener than one may think, if you will crowd the uterus externally by bimanual palpation down upon the finger in the vagina, and then locate and detach the fragments as well as you can, and remove them after that with a good placental forceps. But oftentimes this removal will be imperfect. There will be something left behind, so that some sort of curette will be needed. The curette should be of large type, not too small, so that it cannot do any injury, if it does not do good. I have here a rather large loop which measures $1\frac{1}{2}$ inches by $\frac{7}{8}$ inch. It is semi-sharp and has a cannulated handle. Commonly, in curetting a uterus we make wounds that we do not see and which ought not to be made, and we detach septic detritus which is in danger of engrafting itself into these wounds. Therefore, we need a constant current of water to remove the detritus before it can be engrafted into the new atria.

AUTOMATIC PERINEAL RETRACTOR

I show you a perineal retractor which is a modification of the idea that we see in the market of instruments of the same type, with a leaden weight attached to the handle. This weight is an unwelcome thing to handle when we have to handle the instrument, and it is not near enough weight to do any good when we are using the instrument. Then I devised this clamp, forming a gentle arc of a circle, which is attached by one end to the handle of

the retractor and fastened there by a ring slipped upon it. Traction is applied either by hanging a weight in notches upon this arc of a circle, or by tying the latter down with a rubber tube extending to a cross bar between the legs of the operating table. I usually use weights from ordinary large scales, a weight that weighs five pounds, one eight pounds and another ten pounds. If I go some distance, I take a rubber tube with me in place of the weights. The desired amount of tension can be obtained, and the blade of the speculum within he vagina can be given the desired slant, without any danger of dislocation or traction in the wrong direction; so that this important service is attended to entirely by gravitation without any human being's exertion and it leaves the hands of the assistants entirely free for more skillful aid, which is usually needed in major vaginal operations.

There are two of these retractors. One has a wider blade, and spreads the posterior commissure of the vagina more widely apart, and the other narrower. The wider one I use by preference. The other one can be had, however, if someone wishes it.

DISCUSSION ON THE INSTRUMENTS EXHIBITED BY DR. GOLDSPOHN

Dr. Charles E. Paddock: Dr. Goldspohn presents the curette for our consideration, which is used for curetting the puerperal uterus. I can hardly agree with the Doctor as to the efficacy of this instrument. The indications for curetting the puerperal uterus are, I believe, few and far between. If the indication should arise for exploring the interior of the uterus soon after delivery, the finger offers a more successful and, I might say, intelligent means. This treatment is free from danger, and will accomplish all that is desired. The patient can be placed under an anæsthetic and the hand passed into the vagina and one or two fingers passed into the uterus with ease, making counter-pressure at the same time over the fundus with the other hand. I believe the general results would be better, if a curette were never made for this purpose. The danger of increasing infection by removal of the so-called leucocyte zone and the danger of puncturing the uterus by the curette are possibilities, and I might say, probabilities. Hæmorrhage alone might be considered the main indication for a curettement of the puerperal uterus. Again, irrigation at this time is not devoid of its danger, and we frequently find that the fluid has been carried beyond the uterus into and through the tubes.

Dr. Carl Wagner: With regard to the new curette which has been exhibited and described by Dr. Goldspohn, we are all familiar with the comparatively frequent occurrence of perforations and injuries of the uterus by the use of such instruments in the hands of general practitioners. Ohlshausen taught us never to use anything but the finger to clean out the uterus after an abortion.

A few years ago at a meeting of the Chicago Gynecological Society, there were several cases reported of perforations of the uterus with the curette; and some of you may remember that Dr. Herzog was called upon to testify in a case in which the uterus was perforated with such an instrument. We know that the curette is being used constantly by the general practitioner. It seems to me a larger loop is preferable to a smaller one for removing debris from the uterus; and, as I take it that this instrument is designed more for the general practitioner than for the gynecologist or the surgeon, therefore it will be very useful.

A Member: It is not always possible to pass the hand through the vagina. Recently, I had a case where it was impossible to do this, and found that Dr. Goldspohn's curette was an ideal instrument, and when the cervix is sufficiently dilated there is very little chance of forcing the stream of water into the abdominal cavity, as the reflux will always occur, provided the stream is not too strong.

Dr. Channing W. Barrett: I wish to commend the instrument exhibited and described by Dr. Goldspohn. The finger is useful for exploring and loosening tissues from the uterus after an abortion, but frequently you cannot remove tissues from the uterus in this manner. The curette that we use for ordinary purposes does not answer at all, as it is too small and is apt to cause perforations. There are different instruments made on the type of the Goldspohn instrument, yet not combining all the features of this. The instrument he presents to-night affords the opportunity of using a douche. I much prefer the uterine irrigator and curette in separate instruments but this can be used, with or without the irrigator, as one prefers. It has a very nice large loop for certain cases, and yet I would think it advisable to have a curette somewhat between that and the ordinary instrument, for I think there would be cases of abortion in which this instrument would enter the cervix with difficulty. Yet this instrument would hardly cause perforations, even though the consistency of the uterus is much less than normal. The flange is made right on this curette. The semi-sharp surface projects beyond the dull surface, and that is an advantage. The semi-sharpness is important — not to be real sharp, not to be real dull. A well-constructed ovum forceps answers the purpose well in cleaning out the uterus in some cases; it fills in the breach

between the finger and the curette; and I should dislike to undertake continuously to do this work of cleaning out the uterus after abortions, without being prepared with all three of these instruments — a trained finger, a well-constructed ovum forceps, and a well-constructed curette.

Dr. Paddock: In my previous remarks, I meant a uterus that would admit a flat instrument.

Dr. Goldspohn (closing the discussion): In regard to the remarks of the chairman (Dr. Paddock), I will simply say that while his principle is correct to a certain degree, yet there are cases, as Dr. Barrett has mentioned, where something else is needed. Now, there are many puerperal cases with beginning sepsis that is no longer altogether within the uterus. There is some infiltration around it, yet from the nature of the discharges from the interior of the uterus, it is evident that there is something left within the uterus that ought to be removed. Then you have a large uterus already beginning to be fixed in its neighborhood and to the tissues round about. If you want to make the finger reach the bottom of that uterus, you must do violence to its bed. You may dislodge thrombi that have already formed in veins in the broad ligaments; and surely you will do vastly more harm, in the absence of this instrument, with the finger to such a uterus and its surroundings, than if you leave the uterus carefully *in situ* and curette. As to liquid passing into the tubes in a case in which the neck of the uterus is large enough to admit this large loop, there is practically no fear or possibility of that, if the uterus is not markedly retroverted. In an extremely retroverted, large, fixed, puerperal, septic uterus, I would doubt the propriety of washing out; but in the absence of marked retroversion of the uterus, there can be no possibility of liquid going into the tubes, even if they are open.

Report of Cases

Total Absence of Internal Generative Organs

Dr. Albert Goldspohn: I wish I could demonstrate the woman whose case I am about to report to you, but that is not my privilege. This woman, about forty years of age, was quite stout and excessively fat. Usually she had always been in fair health, and labored for her living. She was married the second time. Her husband, who himself was sexually incompetent, had never found out that his wife had no internal generative organs. Both he and his wife had the idea that she had some tumor, because she had a large pendulous abdomen; and for a number of months she had been having pain in the right side at intervals and subsequently it occurred in regular paroxysms. When I examined the woman for the first time, she had a temperature of 100° in the evening, and evidently had a subacute pelvic peritonitis from some source, which I took to be from a genital source, from the tube or ovary, and therefore ordered the woman to go home and go to bed as much as she could, for at least ten days or two weeks, upon the principle which I hold that pelvic inflammations that come from a genital source, and not from an intestinal or appendix source, should not be operated on in the acute stage; that we should wait until the acute condition has subsided before we operate because pelvic peritonitis from a genital source will practically never become a general peritonitis with ordinary care. After two weeks she returned, with no elevation of temperature, and with less abdominal tenderness. In opening the abdomen, a diseased appendix was found, but there were absolutely no internal generative organs. There were the rectum and bladder as we find in a man, but nothing beyond that. We removed her appendix and that was all. Her external feminine characteristics appeared to be normal.

Dr. Channing W. Barrett: I wish to report briefly a case that came to my clinic on the West Side about two years ago. The patient was a young woman, eighteen years of age, who had never menstruated. She had been married two weeks before coming to the clinic, but she was not as fortunate in her choice of a husband as was the case mentioned by Dr. Goldspohn. She was unable to have sexual intercourse, on account of the lack of a vagina. We could find no evidence of internal generative organs, although their absence was not proven by operation. She left the clinic and was charged to come back, but did not. We assume that there was an absence of internal generative organs, only because of the absence of symptoms pointing to menstrual difficulties and the entire absence of a vagina.

A Member: About twenty-five or thirty years ago, a young woman consulted me as to the reason why she did not have her periods. On examination, her external organs were found to be perfect, but there was no evidence of internal generative organs. There was no uterus. I took her to the late Dr. William H. Byford, who examined her carefully, and confirmed my diagnosis. Otherwise, the woman was perfect. She had perfect breasts, good form, and enjoyed good health. She afterwards married, and, so far as I know, lived happily.

Dr. Chas. B. Reed then read a paper entitled, Part I. The Conditions Requiring the Removal of the Child from the Breast, and Part II, the Passage of Bacteria from Mother to Child.

DISCUSSION OF DR. REED'S PAPER

DR. F. S. CHURCHILL: I came to learn; I know absolutely nothing about the elimination of drugs through the breast, from any experience of my own. I can speak only from the clinical side. The general impression I have gained from Dr. Reed's paper, without being able to grasp all of the details, is that there have been too few observations on each specific drug for us to be warranted in drawing any conclusions whatever. For example, in chloroform, he reports but one case where the child of a nursing woman who had taken chloroform, became comatose and sleepy. It does not seem that we can draw conclusions from that one instance any more than I could draw conclusions from a case I saw of a baby who, nursing from a morphine fiend, was habitually sleepy, with diminished respiration, pin-hole pupils, and, as far as I know, had not been given any opium by the mouth. My inference was that the baby had been poisoned by elimination of opium from the mother's milk. I took the baby off the breast and it ceased to be comatose, sleepy, and have pin-hole pupils. Yet I do not think I should be justified in inferring, from that one case, that women generally eliminate opium through the milk.

I should like to ask Dr. Reed if, in these observations, the age of the baby is given and the condition of the mother at the time the milk was examined? It is well known among pediatricians that the breast will vary at different times during lactation, being at times merely a secretory organ, and at other times an excretory organ plus a secretory. When it becomes excretory, it is regarded as being in a state of unstable equilibrium. This condition exists in nursing women the first week, and it will occur at times later, during lactation under varying conditions; it is very apt to occur if the woman is menstruating, or under certain mental conditions. The breast is apparently thrown into a state of unstable equilibrium, the baby is hard to satisfy and generally goes to pieces. In these investigations, do they state the conditions, whether or not the mother was menstruating at the time the drug was given? It seems to me that it would be of practical value to know this, because the chances are we should be much less inclined to give any of the drugs that are injurious to the baby at the time the woman was menstruating than when she was not.

With regard to the experiments on goats: goats are not human beings and probably the influences controlling the production of milk would not act in them just as it does in the woman. We would not be justified in considering that, because a goat excreted these things, a woman would do so.

With regard to "medicating" the child by giving the mother medicine, that strikes me as being exceedingly inaccurate, inexact, and unscientific, and I did not suppose any intelligent physician did it.

In regard to the purely clinical side of the question, I can only say that I feel very sure when certain nursing women eat certain fruits the baby is upset. Why he is upset I do not know. I do not know the scientific explanation, because I have been unable to make any investigations. I know only the fact. A nursing woman must be very careful what sort of fruits she eats, and the same as to certain vegetables that will upset the baby.

There is one interesting phenomenon I cannot forbear speaking of, although it is not exactly germane to the subject. That is the transmission of the Widal reaction through the breast to the baby. It is well known that a baby nursing a woman who has had typhoid and shows the clump reaction, will in its blood give a positive Widal reaction. Consequently if the baby is taken with an obscure illness, and one suspects typhoid, which is rare in the nursing baby, it will be necessary to test the mother's blood, and should it show a positive Widal reaction and should we wish to find how much value the reaction in the baby has, we must first take the baby from the breast. The reaction will disappear from the baby's blood in a day or two after removing it from the nursing woman whose blood gives the reaction.

Now, as to weaning, I think it is a great mistake to take a baby from the breast, except for very good reasons. During the scarlet fever last winter I had a case of scarlet fever in the mother of a four-weeks-old baby. I took the baby off the breast at once. There seemed to be less risk in doing this than in continuing him at the breast. One of my colleagues, however, pursued the opposite course in a similar case, and the baby did not contract the disease. I do not know what subsequently happened to that baby. Mine had more or less digestive trouble through the year then developed pyelonephritis and died. How large a part the digestive disturbance played in that particular case, I do not know.

In regard to menstruation, I think we should be very slow in taking a baby from the breast on that account.

I am still a believer in the analysis of breast milk. I know that some pediatricians attach very little or no importance to it, as we know that milk varies materially during different periods of lactation. One analysis is of no practical value. There should be a number of them, one, say at 10 o'clock in the morning, one at 2 o'clock in the afternoon,

and the other at 6 o'clock in the evening. A mixture of these samples will give us a fair idea of what the milk consists and in what particular direction there is a deficiency, and thus we shall have some guide as to what we ought to do in order to make the necessary correction. For example, I had a baby several years ago, who was doing well, apparently, on the breast, but who stood practically still in her weight for a month. I had the breast milk examined, found it normal as to fats and proteids, but only 5 per cent of sugar, which was far too little for the baby's needs. I figured out the amount of sugar the baby was actually getting at 5 per cent, and what it should have at 7 per cent, fed her the difference in a milk-sugar solution, shortly after which she began to gain in weight. A month or six weeks later, I had another analysis of the breast milk made and found the sugar was 7 per cent. What brought about the change in the mother's milk, I do not know. In the same way, we may find there is a deficiency in fats, and by feeding babies a definite amount of fat, they improve materially. The same may be said with regard to proteids.

Dr Kerley, in his recent text-book, takes a very optimistic view of the future of nursing women. He is of the opinion that the present athletic craze in young girls and young women has brought about much more vigorous women, and that these women are able to nurse their babies longer than the women of eight or ten years ago.

Dr. C. S. Bacon: I believe it was shown some years ago by Ehrlich and others that a number of toxins and antitoxins were found in the milk, and even the amount of diphtheria antitoxin was determined; I believe it was found to be from one-tenth to one-twentieth of the blood serum; also tetanus antitoxin was found in the milk. Another thing that is definitely known is that the colostrum has a certain amount of disturbing effect on the child. The composition of colostrum is not perfectly understood, and just exactly the time of the appearance and disappearance of the colostrum is not fixed. But I believe we have, in the presence of the colostrum, one of the best rules to guide us as to the danger or lack of danger in any given milk, and that is about as far as we can go. So far as the effect of menstruation, or the effect of pregnancy, or the effect of long lactation is concerned, probably, from the observations that have been made, there is no difference in the milk at all. The milk varies so greatly its composition. In the first place, the methods of examination of milk are so much in dispute that practically no conclusions can be reached; some find much large quantities of albumin and of sugar, and even of fat. Fat, of course, can be determined with the most certainty, but the methods of examination are not by any means agreed upon; and taking a series of observations by the same individual, we find great variations in the milk at different times of the day. It makes all the difference in the world whether it is the first or the last milk in the breast; and the general conclusion must be, that it is impossible by any chemical examination to learn much about the milk, and hence it follows that the common practice of pretending to tell anything about the character of the milk from a single chemical examination is a farce. It seems strange that any one should venture to take a child from the breast because he imagines that the milk does not agree, or because he has had a single chemical examination made in a laboratory, where he does not know what methods are used — an examination that, perhaps, found only two per cent of fat, and because of that the child is taken from the breast. I have sometimes given quite considerable doses of morphine, for example, for after-pains. They are severe and, sometimes, last two or three days. I see no reason why a woman should suffer after a long, hard labor, and lose sleep, and I do not hesitate to give one-fourth of a grain, and perhaps repeat it in the twenty-four hours, and let the child nurse during the administration of the drug; and I have never convinced myself that the child was affected. I have, sometimes, given an anæsthetic, generally ether, for an operation during the period of lactation, and never think of stopping the nursing on account of the operation. My practice is to let the child nurse before the patient is given the anæsthetic, and then perhaps ten or twelve hours later, when the patient is in good condition, and I have never seen the child suffer any. So, I have become skeptical about the poison going from drugs into the milk. Of course, the possibility is there, and it is not irrational to suppose that alkaloids and other substances can pass when toxins or antibodies can pass; but it seems definitely proven that in regard to these two substances, at least, it is an unusual occurrence. As to the effect of any of the ordinary foods on nursing infants, experiments were made in the hospital at Breslau a few years ago, and were reported in detail. For some time the mothers on one side of the ward were given all sorts of foods, including cabbage and pickles, etc., and on the other side of the ward they were fed very carefully. The children, in all cases, were weighed carefully and clinical symptoms exactly recorded. Then an exchange was made, and the patients put on the opposite side of the ward were given the general diet. The conclusion was that

there was absolutely no foundation for the notion that babies are affected by the food. I feel rather positive on that ground, that the ordinary foods have no effect at all upon babies. The observations made by nurses and mothers, are of little value; they jump at conclusions that are absolutely without scientific value. The only question I have in mind before accepting the results given by the essayist to-night, is that I wonder how carefully these observations were made and whether we can rely upon them.

Dr. C. E. Paddock: As statistics are of value, allow me to report briefly one case of undoubted chloroform poisoning of a new-born baby. About the ninth day following the birth, it became necessary to put the patient under chloroform. Some hours after the operation the infant was put to the breast. It soon fell asleep and with difficulty could it be aroused. It presented every aspect of chloroform poisoning. This lasted for, at least, twenty-four hours. Since this time I have been very particular regarding putting the child to the breast after birth, especially in cases where prolonged anæsthesia has been given during the delivery. I usually leave directions that the child will not be put to the breast for, at least, twenty-four hours following its birth. As there is no doubt that nursing babies can be affected by mother's milk, under no circumstances should the baby be put to the breast for, at least, twenty-four hours after any operation upon the mother where an anæsthetic has been used, and besides this, the milk should be drawn artificially, at least once before the nursing.

Dr. William J. Butler: Perhaps I should not take occasion to speak on this paper, because I did not hear very much of it. However, I wish to utter a note of warning against the tendency to remove the infant from the mother's breast too quickly. The experience of Dr. Reed, which is undoubtedly vast, bears more directly on the maternal side rather than on the side of the infant.

Concerning the removal of the child from the breast on account of some of the infectious diseases mentioned, there are very few conditions that necessitate the removal of the child from the breast of the mother, Active tuberculosis is the most important of these conditions, not only because tubercle bacilli might be excreted through the milk, but to protect the child from tubercular material coughed up by the mother.

Concerning the removal of the child from the breast in other infections mentioned, cases of acute infection of short duration do not require the removal of the child from the breast. In pneumonia, for instance, that is progressing favorably, there is no reason for removing the child from the breast, although he might be nursed less often than usual. Coughing of the mother, from which the child can be protected, is far more important to the infant, I believe, in transmitting the infection than is the milk. In articular rheumatism, I can hardly see how it would be a cause sufficient to remove the child from the mother's breast, unless the mother was so greatly exhausted, or reduced by the disease, as to demand that it be done. In cases of staphylococci infection, I can conceive of no infection of this character sufficient to warrant removing the child from the breast, unless it be a mastitis which involves the entire breast. Even then, the child could be nursed by the opposite breast. There are few reasons for removing the infant from the breast in the first weeks, when it is so important to the future of the infant. Scarlet fever and even erysipelas, provided the latter does not involve the breasts, are not indications for removing a child from the breast.

In all these infections the infant has the advantage of the immunizing apparatus of its mother, as well as its own. I regard the dangers of contagion from infections in the mother, which are not alarmingly frequent, as of far less import to the infant in the first weeks or months of life, than the inevitable dangers of artificial feeding at this early age.

Dr. Channing W. Barrett: One very important thing that should take place in the mother, after the birth of the child, is the involution of the pelvic organs. If the child is taken immediately off the breast, there is a certain amount of subinvolution following. Nursing the child aids involution of the pelvic organs, even to hyperinvolution, thus giving the pelvic organs a certain period of rest which is advantageous, from these considerations. This should be take into consideration when the advantages and disadvantages to the mother are being weighed.

Dr. Gustav Kolischer: I think Dr. Reed's paper is a most appropriate one for a meeting of this kind, because he has given us the present status of a very important question. The paper shows evidences of careful preparation along these lines, and as the evidence presented has been sifted by a critical mind, it is necessarily a distinct and valuable step forward. It is an advance in one of the most important branches of medicine — preventive medicine.

Dr. Effa V. Davis: I think the essayist might have given us a more hopeful outlook when suckling is discontinued in the presence of acute diseases. For instance, in mild cases of pneumonia, where the disease lasts but a short time, nursing should be resumed as soon as the disease has subsided.

I desire to emphasize one point, that there are many physicians who do not realize how much they are injuring the mother by putting the child at the breast again, following some diseases, because these mothers have not seen the last of their troubles when they have ceased to nurse their babies. Some of them are invalids for many months afterwards.

Dr. Charles B. Reed, in closing, said:

In reply to Dr. Churchill, I would say that the age of the baby was not taken, so far as I could make out. The cases I have quoted are not clinical cases, and for that reason I expected to bring out more clinical cases in the discussion to-night. The cases reported were apparently scientifically demonstrated. The literature abounds in clinical reports, but as Dr. Bacon states, they are not scientifically observed. I was greatly astonished to find such cases are extremely rare. Where I was not confident the observer had gone carefully over the ground, I referred to them casually and emphasized that they were not as yet scientifically demonstrated. The literature is extremely barren of cases of that kind, although abundant in clinical cases. Of course I agree with Dr. Churchill in regard to the value of animal experiments. They are valuable only as a means of more or less imperfect education as to what might happen in the human family; and I willingly concede how little the value they possess.

I regarded the chief value of my paper to be in the discussion that it might elicit. I have been very much astonished to find how little literature we have on this subject in English, and that the French and Italians are the only men who have studied this work to any great extent; and I confess my own ignorance was the starting-point for the working out this paper which has been a source of extreme interest.

I find myself quite in accord with the gentlemen who have criticized the paper, in almost every respect. It is, of course, the ideal to keep the child at the breast whenever possible; but the object of the paper is to call attention to some conditions which, in my opinion, should or may require the removal of the babe. The remarks of Dr. Churchill were cogent and to the point. I think possibly he emphasized, a little more definitely than I intended to do, the withdrawal of the baby during the menstrual flow. It was not the intention that the child should be removed permanently from the breast on account of the difficulties arising during the menstrual flow, but that when symptoms pointing to intestinal difficulty appeared, and when they could not be traced to anything else, and could be coordinated in time possibly, and in other respects with the menstrual flow, it was the part of prevision, at any rate, to remove the child until it should be able to nurse a healthy breast or take the unintoxicated milk, if I may use that term.

The constantly increasing weight of the child is the great desideratum; and the presence of intestinal difficulties of one kind or another, showing infection, irritation, indigestion, or similar conditions, is simply a signal for an accurate investigation of the reasons for such a change, and the removal of the child, if it can be traced either to the mother or to some condition which the mother presents; and, of course, involves the immediate restoration of the child to the breast when such a condition disappears. On the contrary, I cannot endorse the opinion that has been expressed to-night of using the baby merely as a medicament, merely as a means for restoring the mother to normal health, or for obtaining a desirable change thereby in the mother, when conditions exist that will by such an act imperil the life of the child. For instance, if we have a serious puerperal infection, with the consequent bacteriæmia which must invariably be present, I would regard it as highly criminal to put a baby to the breast for the purpose of securing thereby the much-desired involution of that organ. Neither do I believe it would be logical to produce any other organic change in the mother at the expense of the child, under such circumstances or by such means. The child has now become a definite entity; it is entitled to just as much consideration as the mother, and this consideration must be accorded to it, and its protection must be just as marked and just as well observed as that of the mother. I do not think we are justified in imperiling the child to the least degree for the sake of the mother. I do not believe Dr. Barrett meant, in cases where bacteria float in the blood, or in any of those infections in which the blood is necessarily filled with bacteria, that the child should be used for such a purpose.

Dr. Gustav Kolischer read a paper entitled, Successful Treatment of Chronic Gonorrhœal Endometritis.

DISCUSSION

Dr. Albert Goldspohn: I would like to ask Dr. Kolischer as to the strength of the solution he uses on the intrauterine tampon.

Dr. Kolischer (closing the discussion): I think I mentioned in my paper that I use three per cent albargin.

Albargin is a so-called organic silver salt which produces a strong reaction without causing much pain.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

JOHN B. MURPHY, M. D.
FREDERIC A. BESLEY, M. D.
WM. C. DANFORTH, M. D.
AIMÉ PAUL HEINECK, M. D.
E. WYLLYS ANDREWS, M. D.
WM. R. CUBBINS, M. D.
M. G. SEELIG, M. D.
GEO. E. BEILBY, M. D.

JUXTA-INTESTINAL AND JUXTA-UMBILICAL ENTEROID CYSTS. By Ch. Bouveret.

Under the name of enteroid cysts, we designate cysts the histological structure of which recalls that of the intestine. If these cysts be near the abdominal wall and be remnants of the omphalomesenteric duct, we call them juxta-umbilical enteroid cysts. If they be in the neighborhood of the intestine, we call them juxta-enteroid cysts.

These cysts are congenital and their development is intimately connected with the involution of the omphalomesenteric canal. We are dealing with the isolated and encysted debris of this duct They co-exist at times with other congenital malformations. These cysts are almost always unilocular, not very voluminous, rarely exceed the volume of an orange. They contain a viscous fluid, clear or brownish-yellow in color; this fluid is at times hemorrhagic, and contains in suspension fat and cholesterin. In relation to the intestine, they are submucous, intramuscular or subserous. In the last case, they may be seated at the free border of the intestine or at its mesenteric border, separating the two folds of the mesentery. Their histological structure is very analagous to that of the intestinal wall, with some differences nevertheless. The wall is very thick and is lined with cylindrical epithelium. There are no true glands of LieberKühn, but there are irregular and ramified glanduliform crypts. At times, these crypts are exuberant enough to give to the wall an adenomatous aspect. It contains no lymphoid formations.

From the clinical standpoint, these cysts are observed especially in early childhood, and though congenital, they may reveal their existence but at advanced age. They present only vague symptoms and it is only the occasion of complications such as an intestinal occlusion that leads to their discovery. In some cases, vomiting occurs and by examination one can feel a regular, not very voluminous, tumor, the characteristics of which are not very specific.

The diagnosis of these cysts is very difficult. So far, it has never been made before opening the abdominal wall. We must think of the possibility of an enterocystoma in cases of acute intestinal occlusion that occur a few days after birth, especially if the subject be the bearer of other malformations.

The prognosis of these cysts is serious, owing to the frequency of the complications. The treatment has nothing particular. Most always, the indication is an operation for volvulus or drainage with extirpation of the cyst.— *Kystes enteroides juxta-intestinaux et juxta-ombilicaux. Archives générales de Chirurgie.* 25 janvier, 1908.

AIMÉ PAUL HEINECK.

THYPHOID CHOLECYSTITIS. By Khautz.

Owing to symptoms of cholelithiasis, most cases of typhoidal cholecystitis are operated long after the disappearance of the typhoid fever. Only rarely is it necessary to operate in the course of typhoid fever.

From the clinical standpoint, typhoid cholecystitis may be classified into two categories: 1. The cases which are diagnosed in the course of general infection, and 2. the cases which appear long after the disappearance of all typhoidal symptoms.

In the first, as a general rule, one finds no calculi, but only an emphyema of the gall-bladder. In the second, calculi are never missing. Cultures of the contents of the gall-bladder show typhoid bacilli long after the infection, even ten years after. The history is obscure, and often throws no light upon the path of the infection. The obscurity of the symptoms is shown by the following case:

A woman, 34 years of age, without a history of typhoid fever, showed all the symptoms of an acute suppurative cholecystitis. At operation, we found the inflammed gall-bladder filled with brown-

ish, serous, odorless fluid and containing many calculi. A cystectomy was performed and the next day there was a critical fall of temperature. Cure followed. The bacteriological examination of the contents of the gall-bladder showed a pure culture of typhoid bacillus. Eighteen days after operation, the Widal reaction was positive.— *Sur la cholécystite typhique. Archives générales de Chirurgie.* 25 janvier, 1908.

Inguinal Hernias Said to Have Lost Their Right of Residence. By Legrand.

In all individuals having a hernia of this nature, there is a diminution of the size of the peritoneal cavity and a tendency to general ptosis of the viscera. These hernias, despite their extraordinary volume, are not associated usually with marked functional disturbances. Their complications, however, may imperil the lives of their bearer. These hernias, as all other hernias, should be operated. However, before attempting to make a radical cure, attempts to return and to keep the intestines within the abdominal cavity should be made. Only exceptionally is it permissible to resect the intestines.

For the rebuilding of the abdominal wall, the preferred method is Bassini's method. But in these cases, the hernial rings are so patulous that it is very difficult to follow rigorously any stereotyped method. In cases where the abdominal wall is unusually weakened and where we very much fear a recurrence, the complete closure of the inguinal canal can be proposed to the patient. After the operation, the patient must wear for a long period an abdominal binder, with a pad for support of the cicatrix. Counterindications to operative intervention are few. Therefore, most of these hernias can be returned to the abdominal cavity, and their right of residence therein regained. — *Des hernies inguinales dites ayant perdu droit de domicile. Archives générales de Chirurgie.* 25 janvier, 1908. Aimé Paul Heineck.

Sterilization of Metal Instruments Without Rusting.

Joseph Levai calls attention to the fact that steel instruments rust as a result of coming in contact with oxygen, carbon dioxide and moisture. If one of these three factors be absent, rusting cannot occur. The iron of the instrument combines with oxygen and carbon dioxide to form ferrous carbonate; and this ferrous carbonate, in the presence of moisture, is converted into ferrous oxide or rust. The principle upon which Levai proposes to avoid rusting rests on the fact that all carbon dioxide is absorbed by the addition of sodium hydroxide (Na O. H.) to the water in which the instruments are boiled. He recommends a ¼ per cent solution and reports that for over 10 years he has used this method, and that during this time he has never been bothered by the rusting of instruments. Moreover, the solution does not in any way impair the cutting edge of instruments. Sodium carbonate, which is commonly used, does not accomplish the same purpose as does sodium hydroxide, for the reason that it does not combine with carbon dioxide. The lightest coat of nickeling is in no way affected by the hydroxide solution. It is essential that the solution should not be stronger than ¼ per cent, in order that the instrument be not rendered slippery.— *Cent. f. Chir.*, No. 5, 1908. M. G. Seelig.

Experiences in Operating for Abscess and Gangrene of the Lung.

Professor W. Korte, of Berlin, in this lengthy paper details his experiences in 58 cases of surgical pulmonary disease. The article adds an almost complete chapter to the subject of lung surgery, and takes up in detail questions of etiology, physical signs, diagnosis and operative technique. As a result of his clinical experience, Korte concludes that acute pulmonary suppuration should be treated medically for a few weeks, unless the process is a very putrid one. If despite this treatment, temperature persists and the disease progresses, a pneumotomy should be performed. As a rule the prognosis, after pneumotomy is good.

In cases of bronchiectatic cavities, an operation should be performed only if the cavities are confined to one lobe. In these cases the operative procedure must be very radical:— wide resection of the chest wall, extensive splitting of the lung tissue thoroughly to expose the cavity, or even resection of a lobe of the lung.

It still remains to be settled whether or not the operative mortality is improved by operating in a negative pressure chamber.

A fairly comprehensive casuistic report of all the cases operated upon is appended to the paper. — *Arch. f. Klin. Chir.*, b. 85, h. 1.

M. G. Seelig.

The Pathology and Treatment of the So-called Bantis' Disease. By Dr. F. R. Nager and Dr. J. Baümlin from the Canton Hospital in Münsterlingen. Director, Dr. Conrad Brunner.

These writers report a case of Banti's Disease in a young woman of 25 years, operated and the spleen removed by Brunner with a successful recovery, the patient being in good health two years

after operation. Examination of the spleen removed in this case, showed a high degree of hyperplasia of the spleen stroma, or an indurative splenitis. A marked degree of vessel change, consisting in sclerosis and circumvascular formation of connective tissue, was present, leading to atrophy of the follicles. Hemorrhages into the tissue and scars of old infarcts were found and many giant cells were present. Eosinaphiles were plentifully present.

As to symptomatology, the first and most marked indication of the disease is the progressive enlargement of the spleen. This may last for years before other symptoms, particularly a particular form of anæmia appears. The blood findings are of particular importance. The results of Nager and Baümlin's work along this line do not vary from those of standard authors already in print.

As to treatment the writers are of the opinion that the only correct treatment is splenectomy, as the prognosis is good and the result permanent. They emphasize that the spleen should be removed before the liver complications become manifest.

As to the operative prognosis, fourteen cases are quoted from the literature, operated by various surgeons, of which 10 recovered. Three of the 4 fatal cases died of hemorrhage. Comparing these results with other statistics a total mortality of reported cases of 20 to 30 per cent is quoted.

The most important points are summed up as follows:

1. Clinical observations and histological findings indicate that Banti's Disease is to be looked upon as a clinical entity, and as a primary disease of the spleen.

2. A careful differential diagnosis rules out many mistakes, many of which are shown in the cases published up to now. In particular are hereditary lues and hepatic cirrhosis to be separated from Banti's disease.

3. The first or anæmic stage of Banti's disease is identical with primitive splenomegaly and splenic anæmia.

4. Splenectomy is the only correct therapy for true cases of splenomegaly with liver cirrhosis. To this may be added, in the ascitic stage, a Talma operation.— *Beitrag zur Pathologie und Therapie de sogenannter Banti's-schen Krankheit Beiträge zur klinischen Chirurgie*, vol lxv.

W. C. Danforth.

Glycosuria as a Consequence of Abdominal Tumors. By Wilhelm Evelt of Munich.

Evelt reports a case of glycosuria which he considers due to the pressure of an abdominal tumor on the pancreatic duct.

The patient, a woman of 41, had a multinodular myomatous uterus, reaching nearly to the umbilicus, and a large multilocular cyst of the left ovary. Before operation the urinalysis showed the presence of albumin and quite an amount of sugar. After the removal of the uterus and the ovarian tumor, no albumin or sugar was found at any urine examination after the fourth day. After the seventh day she had regular ward diet. She was under observation for one year afterward and neither sugar nor albumin was ever found in the urine.

Evelt has found but one similar case reported. Fellner reported in the *Wiener Klinischen Wochenschrift* a case of double pyosalpinx in which sugar present before operation disappeared afterward.

In explaining the phenomenon Evelt states that diabetes is out of the question, in as much as the glycosuria was transient. After review of the known or hypothetical causes of glycosuria, we must conclude that an apparently abnormal activity of the pancreas is the cause in this case. Atrophy of the pancreas cannot explain it, in as much as an atrophied pancreas could not become normal again in four days. The rapid disappearance of the sugar after operation seems to point to a mechanical cause of the glycosuria. Compression of the pancreatic duct is the most likely mechanical cause. The tumors which filled the entire abdominal cavity were sufficient to exert such pressure on the duct; and this is the explanation offered.

It is granted that ligation of the pancreatic duct in animals has never caused glycosuria, but too close analogy must not be drawn between animals and men. Moreover, in 1906, Marchand described a case in which glycosuria was apparently caused by stones impacted in the pancreatic duct.

This case emphasizes the care which must be taken in examining a patient with glycosuria. A small tumor compressing the duct and giving in itself no symptoms may cause a diagnosis of diabetes to be made, the tumor itself being entirely overlooked. Therefore, in all cases of glycosuria the region of the pancreas should be carefully examined.— *Monatsschrift für Geburtshülfe und Gynäkologie*, bd. xxvi, h. 6, Dez., 07.

Gerry R. Holden.

Jejunostomy. By J. L. David.

In cancer of the stomach, jejunostomy is a palliative operation of secondary value. It is only performed when gasterectomy and gastro-enterostomy are counterindicated and can give only mediocre results. In peptic ulcer, its indications are more numerous. The uncomplicated non-pyloric ulcer, if it resists medical treatment, is beneficially influenced in its course by the creation of a jejunal mouth. In burns of the œsophagus, of the stomach etc., jejunostomy is the operation of choice. It has

given good results and can give better ones. Two operative procedures give excellent results:

1. Procédé en Y avec torsion à la Souligoux ou variantes de Quénu, de Kelling.

2. Procédé de Eiselsberg-Witzel.

The former operation, more complicated, is for patients that have still much vitality. The latter, simpler, more rapid, less grave, is adapted to weakened patients incapable of supporting an intervention of some duration.

Jejunostomy is permanent or temporary. If temporary, the fistula must be maintained a relatively long time even if the improvement is noticeably very rapid. At first, much care must be shown in feeding the patient through the natural channels. Before beginning to feed the patient through the natural channels, it is indispensable to determine whether the gastric chemistry has returned to the normal.— *De la jejunostomie. Archives générales de Chirurgie,* 25 janvier, 1908. AIMÉ PAUL HEINECK.

EXPERIMENTAL SURGERY OF THE LUNGS. (A Preliminary Report). By Samuel Robinson.

Successful operations on the pleural cavity demand at least one factor — the avoidance of lung collapse. The effect of lung collapse is a series of circulatory, nervous and respiratory disturbances which, if collapse is continued, result in death. Collapse must be avoided in one of two ways. Either air must not be allowed to enter between the pleural layers, or the lung must be kept artificially inflated. The former is the keynote of the older methods. Advantage has been taken of the existence of inflammatory adhesions for this purpose. In other cases, adhesions have been produced by the injections of irritating substances into the pleural cavity, or by suturing. The infrequency of intra-thoracic operations indicates the danger associated with the use of these methods. The prevention of collapse by means of withdrawing a lobe, is unsatisfactory, since the field is obstructed and the irritation of the vagus terminals causes respiratory and cardiac disturbances. Until exploratory pleurotomy and intra-thoracic inspection become thoroughly safe procedures, the advance of intra-pleural surgery must be restricted.

The second method, that of artificial inflation, is making rapid progress. This method may be carried out by means of external negative pressure or by internal positive pressure. Sauerbruch, objecting to the latter principle, constructed the negative pressure cabinet. This, on account of its costliness and weight, is not adaptable to private and general use.

Robinson undertook this line of investigation in order to perfect a suitable positive pressure apparatus and to test the objections of Sauerbruch on the basis of practical surgical value, and if the apparatus should prove satisfactory, to note further the effect of positive pressure inflation on blood-pressure and on the cardiac and respiratory functions.

The apparatus constructed consists of a glass cone, provided with a rubber collar, which fits closely around the dog's muzzle. This cone has an inlet for compressed air, which may be mixed with ether in any proportion desired by the operator, and an outlet tube, connected with a water-pressure bottle. On both inlet and outlet tubes are manometers, showing pressure being used. The apparatus is satisfactory for experimental thoracic surgery and is easily controlled by the operator.

Thirty animal experiments were done, ranging from simple pleurotomy to excision of the entire right lung, with 9 deaths and 21 recoveries. Of the deaths, 4 were caused by sepsis and one by leakage. The other 4 deaths occurred in those in which a lobe or the entire right lung was excised. The fatal terminations in these last named cases are hard to explain, but were probably due to the existence of a cavity in which the pressure did not equal that of the unopened side, interfering in this way with the heart action. Removal of an entire lobe was done successfully on several animals.

No ill effects, either immediate or late, were noted from the positive pressure. No emphysema was found at autopsy. The cause of the pleuritic effusion following one-sided pneumectomy, will be investigated further.— *Annals of Surgery.* Feb., 1908. Vol. xvii, p. 184.

STENOSING ULCER OF THE DUODENUM. By Ch. Gautier.

As is usual, the precise diagnosis had not been established. Symptoms were those of ulcer of the pylorus. There was no vomiting of bile, no intestinal hemorrhages. These signs have been given as characteristic of duodenal ulcer. The patient was laparotomized and an ulcer of the second portion of the duodenum was found, to which was adherent the fundus of the gall-bladder. The ulcer was firmly bound to the pancreas. We did not practice an extirpation, we performed a simple gastro-enterostomy. The vomiting disappeared, but the low digestive pains occurring two or three hours after meals, were not cured. These pains must be attributed to the passage of the acid chyme of the stomach upon the duodenal lesion.

The operation which we should have performed is exclusion of the pylorus. The patient declined to submit to another operation.— *Ulcère sténosant du duodénum. Archives générales de Chirurgie.* 25 janvier, 1908.

Jejunal Peptic Ulcer. By P. Vachez.

Peptic ulcer of the jejunum is not an uncommon affection after gastro-enterostomies. The author has been able to collect 36 observations, of which six are personal. From the anatomical standpoint, jejunal ulcer differs but little from gastric or duodenal ulcer. In its acute form, the ulcer rapidly leads to perforation before the peritoneum has had time to react; in the chronic form, which is the most frequent where the intestinal wall is infiltrated, it is callous and there are visceral parietal adhesions. Almost always the ulcer is single and is seated upon the descending branch of the anastomosis.

The etiology of the jejunal ulcer has been much discussed. The author enumerates the different theories advanced and believes that the stasis of hyperacid gastric juice is the abdominal cause of ulcerating jejunitis. The operative technique is perhaps an etiological factor. Anterior gastro-enterostomy favors stasis and thus ulcer formation. Roux Y method of posterior gastro-enterostomy is directed against this stasis and prevents the acid chyme from long sojourning in the jejunum.

Clinically we have two forms: The latent form, with sudden perforation, which gives as an intensely acute peritonitis, always fatal; then we have the chronic adhesive form which is characterized by gastro-intestinal disturbances with peritoneal reaction. This peritoneal reaction manifests itself by the formation of a thickened adherent mass. The diagnosis is fairly easy. Individuals upon whom gastro-enterostomy has been performed, should be attentively watched. The preventive treatment should consist in an appropriate diet to which the alkalies have been added. Once the ulcer is established, surgical treatment should be instituted. The ulcer will be excised and a new opening further from the plyorus must be created.— *L'ulcère peptique du jejunum. Archives générales de Chirurgie.* 25 janvier, 1908.

Stenoses of Typhoidal Origin Located in the Small Intestine. By Ménon Paul.

These may be divided into two main varieties: The occlusions that occur during the course of typhoid fever and in the first month; second, the late occlusions which appear after the first month.

Among the early occlusions, the most frequent form is the invagination; then comes coprostasis and intestinal paresis of such nature as to necessitate enterostomy.

Far more frequent are the late occlusions. They are ordinarily caused by a typhoidal peritonitis, due either to propagation or to ulceration. In a few cases that have been very much discussed, it has been thought the occlusions were secondary to the cicatrization of the typhoidal ulceration, but stenosis following typhoid fever is rare. Stenosis following tuberculosis of the small intestine is very frequent compared with stenosis after typhoid fever.

Peritonitis acts through the mechanism of adhesions, which may be firm or loose depending upon the age of the peritoneal accidents. This peritonitis produces angulations, twists. At times, it is associated with suppurative mesenteric lymphadenitis. Therapeutically, we will act as follows: If the adhesions be recent, it will suffice to separate them. If they be old, extensive, placed in a dangerous region, it will be advantageous to establish an enteroanastomosis between a loop of gut above and a loop of gut below. The other causes of occlusions will be treated according to their nature. The more recent the lesions, the better the prognosis.— *Des sténoses de l'intestin grêle d'origine typhique. Archives générales de Chirurgie.* 25 janvier, 1908.

A Contribution to the Study of Rupture of the Liver. By Von Kippel.

The author reports a case of subcutaneous injury to the right lobe of the liver. The patient had fallen from his horse and his abdomen had borne the weight of the horse and of the saddle. Diagnosis of internal hemorrhage was made. After a minute exploration of the abdominal cavity, a bleeding wound of the right lobe of the liver was seen. The hemorrhage was stopped by tamponade; the patient recovered.

The author discusses the symptomatology of wounds of the liver. Usually, the diagnosis is to be made only after the abdominal wall has been opened, and then it is made by seeing the seat of the hemorrhage.

As to the operative technique to follow, we are still in doubt as to which way is better, to suture these wounds of the liver, or to pack them. The author prefers packing. He thinks it is more rapid, less difficult, and more reliable. The liver must be compressed from below, up towards the diaphragm. Only iodoform gauze should be used.

At the conclusion of his article, the author has collected all the cases of wounds of the liver reported previous to 1905.— *Archives Générale de Chir.* Paris, Dec., 1907.

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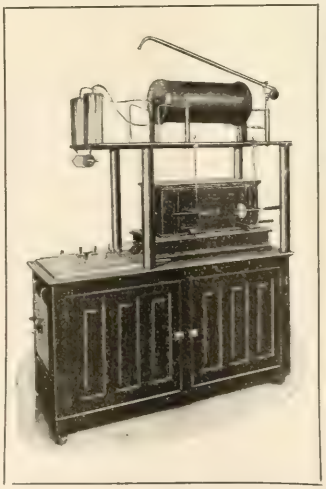

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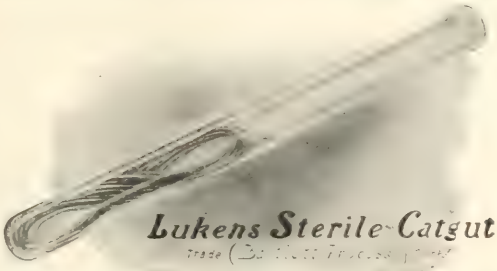

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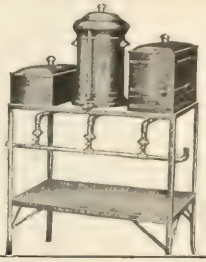

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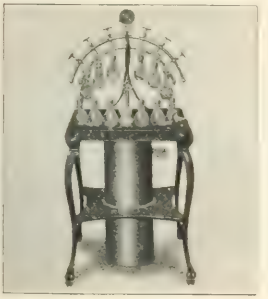

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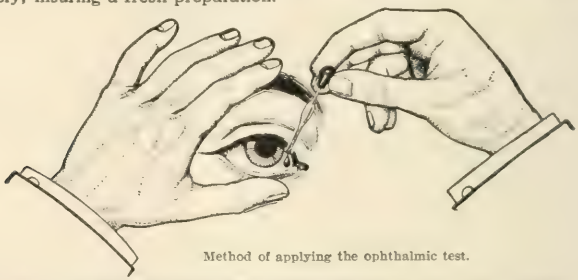

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VOLUME VI JUNE, 1908 NUMBER 6

PERFORATIVE PERITONITIS

GENERAL, FREE, SUPPURATIVE

BY JOHN B. MURPHY, M. D., CHICAGO, ILLINOIS

MINUTE ANATOMY OF THE PERITONEUM

FORMERLY the peritoneum was believed to be an immense closed sac, but the researches of von Recklinghausen on the rabbit, and Schweigger-Seidel, Dogiel, and others on the frog, apparently proved that this was incorrect; they believed they discovered a connection between the peritoneal cavity and the sub-peritoneal tissues through minute openings in the endothelium called *stomata*. These were presumed to be the openings or mouths of the sub-peritoneal lymphatics (making the peritoneum a part of the lymphatic system), and were believed to be guarded by the surrounding endothelial cells, usually pictured as somewhat differentiated from their neighboring cells, which, by their property of contractility, opened or closed the stomata as the needs of the organism directed. Bodies twice the size of red corpuscles were thought to be capable of passing through these openings, gaining immediate access to the lymphatics. In addition to these, smaller openings called stigmata were described, which were variously interpreted as artefacts due to stretching or shrinking of the cells, caused by the action of reagents, as precipitated stains, or as openings left by the passage of leukocytes; but this writer believes an absolutely normal peritoneal endothelium would show no stigmata.

Stomata are described in most text-books of histology; they are very admirably pictured, though in a most diagrammatic manner. In fact, most of the descriptions have been rather vague, as compared with the pictures, and it seems the whole subject is more or less a tradition handed down through the various editions of text-books. One dislikes, however, to dismiss a basis so simple and clear for the explanation of the phenomena of absorption.

More recently Kolossow, Muscatello, MacCallum, and others have denied the existence of stomata. According to these writers the peritoneal endothelium is an unbroken layer of cells having no direct communication with the sub-peritoneal lymphatics. From these writings, and particularly the recent admirable and precise descriptions by MacCallum, the following may be accepted safely.

On the pleural surface may be seen, among the more or less parallel connective tissue bundles, large blood-vessels, nerves, and *lymphatic trunks*, which frequently appear as clear canals branching about over the surface, with especially large channels in the periphery. From these larger peripheral canals efferent trunks emerge, some passing to the anterior mediastinum and its glands, and others backward through the diaphragm emptying into the abdominal lymphatic trunks. An abundant network is formed on the pleural surface with peculiar filmy waves. Penetrating the musculature and tendinous tissue of the diaphragm are short trunks, establishing a communication with the lymphatics on the peritoneal surface,

which are arranged more or less definitely in two layers; a radial arrangement of larger vessels and a parallel one of the smaller more intimately anastomosing superficial vessels. The two are, however, intimately connected. The smaller parallel canals are somewhat beaded or bulged along their course. Valves were not determined. In the peculiar interlacing of the connective tissue bundles, between which the parallel lymphatics run, lozenge-shaped spaces are frequently left, the seat of the aforementioned bulgings in the lymphatics. Here they lie separated from the peritoneal cavity by an extraordinarily thin layer of tissue (a delicate basement membrane between the two endothelial layers), a most favorable entrance point for substances from the peritoneum, undoubtedly an especial adaptation. The endothelial lining, however, is everywhere continuous, no openings of any kind being visible or demonstrable. This basement membrane was shown to consist of a very delicate network of fibrils, in which elastic tissue was abundant, and was imperforate and homogeneous except in the diaphragmatic zone where there were minute perforations or imperfections, a condition which forces us to the conclusion that this is the ideal place for absorption of granular material. Some writers describe pits or diverticula in the diaphragmatic zone of the peritoneum into which particles readily "fall," to be absorbed later.

From an embryological standpoint, too, we must assume that there are no stomata, for the lymphatics develop from a finger-like projection or bud of the endothelium of the subclavian veins, and have no connection with the primitive body cavity or celom. The lymphatics embryologically are, then, modified veins, and we may state that the peritoneum is not a part of the lymphatic system.

PHYSIOLOGY

Wegner calculated that the peritoneum has an area of 17,182 square inches, approximately the same as the skin (17,502). However, the importance of the peritoneum lies not so much in its great surface as in its tremendous absorptive power, which is almost beyond belief, and can be best appreciated by referring to one of his experiments. One hour after injecting 870 c.c.m. of blood serum into the peritoneal cavity of a dog weighing 13,400 grammes, 170 c.c.m. had been absorbed, equivalent to 1.3 per cent of body weight. In rabbits, and sometimes in dogs, this was even more marked, the percentage of fluid absorbed varying from 3.3 per cent to 8 per cent of the body weight.

The paths of absorption have been the subject of much experimental work and subsequent discussion by the investigators, with rather inconclusive results, but it seems generally accepted that both the lymphatics and the blood-vessels are concerned in the absorption of fluids and soluble substances, while solid particles (lampblack, foreign animal cells, and bacteria) are absorbed through the lymphatics, almost, if not quite, exclusively.

The most active portions of the peritoneum, as far as absorption is concerned, are the diaphragmatic and omental areas, with perhaps much the greater share of the work falling to the diaphragm.

H. D. Durham found bacteria in the lymph glands of the anterior mediastinum six minutes after injection of septic material into the peritoneum. Buxton and Torrey found inert particles in the spleen and liver as early as fifteen minutes after injection, in at first small numbers it is true, yet sufficient to be discovered with great uniformity and in from two to four hours in great numbers. In a subsequent paper Buxton reports that the typhoid bacillus was injected into the peritoneal cavity in the "dose of one-half of an agar culture," "the number of bacilli was of the order of four thousand millions." In rabbits which were killed at once after the injection, four of seven were found to contain organs swarming with typhoid bacilli. Since only ten minutes had elapsed from the time of injection of the suspended bacilli until the animals were bled to death, the result in rapidity of absorption was astounding.

What are the paths taken by the morphological elements? Durham found the mediastinal lymphatics turgid with blood soon after the beginning of peritoneal injections. In five to fifteen minutes after the injection of lampblack, Buxton and Torrey found the lymphatics in the anterior mediastinum represented by black lines, while the glands were

also colored, the particles lying for the most part free in the afferent lymphatics and the peripheral sinuses of the glands. Typhoid bacilli, on the other hand, were found mostly in the macrophages,[1] a very few in the neutrophilic leukocytes (which were not as abundant as it is generally supposed that they are), and still others free, i. e., in general, in the same locations as the lampblack particles. Evidently, then, these solid particles had entered the glands by way of the diaphragmatic lymphatics.

PHYSIOLOGY OF THE DIAPHRAGM

We come now to the consideration of the physiological bearing of the diaphragm, the anatomy of which has been discussed. While physiologists are not agreed as to the presence or absence of stomata, experiments, especially those of Buxton and Torrey, have shown the diaphragm is penetrated by inert particles and to a small degree by bacilli (typhoid, anthrax, etc.), and even by such large bodies as chicken corpuscles, without the aid of macrophages or leukocytes. So rapid is this that we hesitate to abandon the idea of entrance through some preformed openings like stomata.

Muscatello suggests that leukocytes in passing through the endothelium (perhaps with the vanguard of the invading particles or bacilli) leave a minute opening through which there is an immediate rush of free particles (whose motive power probably depends upon the lymphatic currents induced by the movements of the diaphragm). An analogous condition is known in the rush of red corpuscles through the walls of a blood-vessel after their penetration by a leukocyte.

MacCallum thinks that the neutrophilic leukocytes are most active in transporting inert particles through the diaphragm; his drawings show these corpuscles busily engaged entering the lacunæ, passing between and under the endothelial cells, some being pictured within the lacunæ, differing therein radically from Buxton and Torrey. The endothelial cells of the peritoneum, and even the underlying connective tissue cells, may become phagocytic in their properties, and finally the lymphatic endothelia may be loaded with particles, undoubtedly additional adaptations to the end that rapid absorption may be effected.

The mechanism of the diaphragm, by which the lymphatic spaces are compressed when it is contracted and conversely widened when it is relaxed, represents in the main the principle of a pump. While MacCallum proved that this was not absolutely essential to absorption, he showed very conclusively, by eliminating phagocytosis of any and all cells by various means, that this action alone was sufficient to determine a certain degree of absorption, even in a dog four days dead.

The constancy of the action of the diaphragm is another element to consider; like the heart, it is in action day and night, thus greatly augmenting its functional powers, that absorption may be accomplished.

In microscopical sections he found the free particles between and within the cells of the roofs of the lacunæ, a picture differing very little from von Recklinghausen's original one. However all this may be, the diaphragm is so constructed as to permit of ready passage of inert particles and, in varying degree, bacteria.

The omentum is also concerned very mildly in the initial rush of free particles, as shown by Buxton and Torrey. Sections of the omentum made within an hour show the afferent lymphatic plexuses filled with free granules which are taken up by the macrophages within two to three hours.

Peritoneal absorption depends upon several factors:

1. Pressure of the abdominal muscles, tonicity, and respiratory contraction.

2. Rhythmic pump-like action of the diaphragm; by virtue of its constant contraction and relaxation, fluid and particles are aspirated from the peritoneum and forced onward.

3. Peristaltic activity: Under the influence of gravity all fluids tend to accumulate in the pelvis. Peristalsis has, among other functions, that of distributing the fluids evenly and preventing their accumulation at the lowest point in the pelvis.

4. Vitality of the peritoneal endothelium. Peritoneal absorption cannot depend entirely upon osmosis as Wegner believed.

[1] A term first used by Metchnikoff to describe a cell derived from the endothelial cells of the great omentum and other situations. La Theorie des Alexocytes, Ann. de l'Institut Pasteur, 1893, vii.

Factors hindering absorption are:

1. Subperitoneal infiltration, lymphatic "cofferdamming."

2. Venous engorgement.

3. Diminished peristalsis, i. e., in inflammations of peritoneum the fluids gravitate to the pelvis, because of the intestinal paresis.

4. Diminished or shallow respiration in lessening the diaphragmatic movement, another feature in the symptoms of peritoneal infection.

5. Lowered abdominal temperature. The muscular and nervous elements concerned in absorption are less irritable if the temperature be lowered by the local application of cold; peristalsis is then less active and the tendency for the fluid to gravitate again favored.

6. Drying of the peritoneal endothelium, e. g., by exposure during an operation.

7. Lowered intra-abdominal pressure, as after a laparotomy.

8. Certain positions of the body which favor gravitation toward the pelvis.

Factors favoring absorption:

1. Abrasion or exfoliation of the endothelium will, under certain circumstances, favor absorption; it is also to be borne in mind that the phagocytic action of the peritoneal endothelium is thus destroyed.

2. Tearing of adhesions of the peritoneum, exposing the underlying vessels, increases the possibility of absorption through the blood stream.

3. An acceptable material, e. g., physiologic salt solution, certain bacteria, ptomaines, etc.

4. Pressure and continued contact; pus *under pressure* is readily absorbed.

5. Vasomotor paresis; toxic absorption paralyzes the vasomotor center and a "vicious circle is established."

Protections against injection:

1. Peritoneal fluid. There can be no doubt that this fluid, small in amount though it is, has great bactericidal properties; it is *increased greatly*, both in quantity and in bactericidal potency, even very early in peritoneal infections.

2. Plastic powers of the peritoneum. The irritation of foreign bodies produces a local peritoneal exudate with deposition of fibrin, thus encapsulating the foreign body and rendering it harmlessly held on the surface until it can be englobed by the macrophages or neutrophilic leukocytes. It may be said that fibrin has the same rôle in the peritoneal cavity that the Board of Health plays in endeavoring to isolate an infection and protect the community. Pus in the peritoneum, from a clinical view-point, may be classified as, *a*, defensive; *b*, neutral; *c*, destructive. Buxton, in several elaborately planned experiments, has thrown much light on the subject of absorption. One series of experiments applies in particular. Seven rabbits were given an intraperitoneal injection of very moderately virulent typhoid bacilli in suspension in dose "of the order of 4,000 millions," and were killed at once, scarcely ten minutes elapsing from the time of injection until the circulation had ceased, as a result of bleeding the animal to death. Four of these were shown by plating methods to contain in the peritoneal cavity from 1,200 to 2,500 millions of organisms, and the organs (liver, spleen, bone marrow, etc.) to be literally swarming with them. The other three had in the peritoneal cavity from 1,000 to 350,000 individual organisms with just fifty-two colonies in the plates from the organs and blood. "Everything in the three cases points to a sudden, one might say explosive destruction, which must almost certainly be due to the bactericidal action of the body fluids and not to the comparatively slow process of phagocytosis." It must be stated that it has been shown repeatedly that there is an initial leukopenia in the peritoneal fluid which lasts from one to three hours after foreign material enters the cavity, and, while the interpretation of this phenomenon varies greatly, we have in it another justification for the belief above quoted. This explosive destruction was real, for a microscopical examination of the omentum showed no organisms on its surface.

This corresponds to the destruction of bacilli *in vitro* by the body fluids, so often carried out experimentally.

If, one hour after the peritoneal cavity has been injected with lampblack, it be gently washed under the tap, the diaphragm and the omentum are found to remain black, all other areas leaving a clean peritoneal surface. If the omentum be examined under the micro-

scope the particles of lampblack, or if typhoid bacilli have been injected, the organisms will be found scattered over its surface in a peculiar net-like distribution, which is proven by Weigert's stain, to be due to an enmeshing network of fibrin in which the particles have become entangled. Later, in one-half hour for typhoid bacilli, and almost immediately for lampblack (by which this subject is most easily studied) one finds the particles englobed in the cells of the peritoneal fluid (macrophages) which are present even before the leukocytosis of the first to the third or fourth hours, indeed they are stuffed so full that one can scarcely see the cytoplasm. Apparently the particles have been held upon the omental surface where the phagocytes can more readily devour them, being less elusive there than in a free fluid; besides, it is well known that phagocytes are more busily engaged in their policeman-like duties if they are upon a surface over which they can crawl.

Another work along this line is that of Dudgeon and Ross. In an experimental peritonitis due to the B. ærogenes capsulatus, the peritoneal fluid was found to contain 90.2 per cent of polynuclear finely granular leukocytes, *none of which was phagocytic*, while in the great omentum there were 99.6 per cent of the same cells, *every cell containing micro-organisms*. (It is to be noted that these writers differ from Buxton in their results, showing the finely granular cell to be the more important phagocytes. The difference may depend somewhat upon the variety of micro-organism used in the experiment. It will be remembered that MacCallum also differed from Buxton.)

3. Phagocytosis in the peritoneal cavity. The initial leukopenia, after injections into the peritoneal cavity, has already been spoken of. But even early Buxton found a certain number of macrophages to contain particles and bacteria. In two or three hours the polynuclear neutrophilic leukocytes arrive in large numbers, and take up the particles with great avidity. In twenty-four hours the macrophages arrive in large numbers and englobe the "microphages" (leukocytes) and possibly, also, free particles.

4. Phagocytosis on the omentum. This has already been mentioned, but in addition another phenomenon has been observed. The omentum of young rabbits contains numerous dull, whitish opaque spots, some of which contain capillary tufts, others do not; in the full grown rabbit all are supplied with capillaries. Under the high power objective one sees, in the former spots, cells with branching processes resembling connective tissue cells, while apparently on the surface are a few large, round, mononuclear cells. Intermediate forms are present and one gains the impression that the latter are becoming metamorphosed into the former, at the same time penetrating more deeply into the omentum.

In grown rabbits these cells are found to have become more elongated and to have arranged themselves along the capillaries. Many contain granules, probably representing disintegrated leukocytes; Buxton and Torrey called these "trailers." They found them previously described by Ranvier as "clasmatocytes." These take active and early part in the phagocytosis of lampblack, chicken corpuscles, and typhoid bacilli.

Whether these are metamorphosed macrophages or phagocytic connective tissue cells is of no importance from our standpoint.

5. Phagocytosis in the lymphatic nodes. As soon as the particles reach the inner and efferent sinuses of the lymph nodes, they are englobed by the macrophages; the polymorphonuclear leukocytes apparently take little part.

With typhoid bacilli the same is true except that they are attacked earlier, i.e, in the afferent sinuses.

There seems to be a selective action among the phagocytes as to which, the macro- or the microphages, are to attack the invaders. If staphylococci be injected the microphages are much more actively engaged than in typhoid bacilli injections, though their chief opponent is still the macrophage.

In four to five hours degeneration in the bacilli (practically all intracellular) is evident.

6. Phagocytosis and bacteriolysis in the organs. After injection of typhoid bacilli, Buxton found that the liver is earliest and most extensively concerned in the localization of the organisms, next to it the spleen and bone marrow. The power of explosive destructions in the peritoneal fluid varies greatly in the different

animals, so, too, does the destruction in the organs vary. During the first two or three hours the bacilli decrease very rapidly in numbers. This is probably due more or less to the bactericidal action of the body fluids, and, as this power becomes exhausted, the slower process of phagocytosis continues the defensive measures. The findings are entirely in accord with this statement. During the first two hours the organisms decrease rapidly, then during the next three or four hours they increase rapidly, probably by both multiplication and arrival of new invaders. From this time on a gradual decrease takes place until all have disappeared. Of course, it is entirely possible that this secondary destruction is due to a recovery of the bactericidal powers of the body fluids. There is experimental support of this. *This has great practical significance,* as it shows that, if we can tide the patient over the initial lethal dose, the resistance is so enormously increased that recovery is the rule, even though secondary infections occur as indicated in the analysis of our cases. Bail found that bacteria are less actively destroyed in serum *plus organ cells*, work which Buxton has confirmed. Hoke made experiments with similar results, concluding that the organ cells absorbed the complement, thus depriving the serum of its bacteriologic powers.

It may be well to review, in a general way, Buxton and Torrey's work:

1. There is a rapid extracellular *bacteriolysis* in the peritoneum immediately after injection of bacteria. It may be explosive or take from one to two hours.

2. After this has expended its force the process of destruction continues more slowly by phagocytosis.

3. There is no reason to believe that the destruction in the organs is more important than that in the peritoneum, in fact, the contrary is probably truer.

4. Phagocytosis in the tissues is most active in the anterior mediastinal lymph-nodes.

PATHOGENESIS

We have long recognized three forms of peritonitis — chemical, mechanical, and bacterial. Tavel and Lanz first introduced the term "chemical" peritonitis, applying it to cases in which they failed to find micro-organisms (or only the staphylococcus albus — which they chose to consider a contamination) in the peritoneal exudate, sometimes even in very septic cases. The error may lie in this, that their cultures were probably made from the fluid only. Recent researches of Gruber and Durham, Buxton, Dudgeon and Sargent, and others have shown that a very short time after injection of organisms into the cavity the fluid may be sterile, while the surface of the omentum, the intestines, and possibly the diaphragm, hold the micro-organisms on a thin coating of fibrin, or the organisms may be destroyed "explosively." It seems, then, that clinically the term "chemical" peritonitis is of diminishing importance, and recent enunciations are more and more emphatic on this subject. "The practical outcome of the bacterial origin of peritonitis is shown by the mental attitude which is gradually abolishing the term 'acute peritonitis' in favor of the more rational one of 'acute peritoneal infection.'"

Durham, twelve years ago, stated that "pieces of omentum will sometimes show both microscopically and in culture that microbes are present whilst the fluid of the peritoneum is sterile. . . . . These facts make one chary of accepting the 'chemical (aseptic)' peritonitis of Tavel and Lanz."

However, we know that the rupture of ovarian cysts, the contents of which are sterile, are capable of producing a peritonitis; the application of foreign chemicals (tr. iodine, turpentine, formalin, croton oil, bacterial toxins) or the escape of body chemicals from a neighboring organ (trypsin, bile, urine) may produce, pathologically at least, a typical peritonitis. It is our opinion that the term "chemical peritonitis" should be retained, if only to apply to the form produced experimentally or therapeutically to prepare the peritoneum to resist later infection or exposure to infection, as we frequently prepare the synovia preceding operations on the knee-joint and for the form experimentally produced by nuclein, oils, and aleuronat to be spoken of later. If the peritoneum be exposed to chemical irritants the superficial layer of cells, i. e., the endothelium, is destroyed and inflammatory mani-

festations appear, as hyperæmia, proliferation and roughening of the endothelia, diapedesis of leukocytes, and the formation of a serous or fibrinous exudate, occasionally leaving permanent adhesions. This form of peritonitis, as an inflammation, is never fatal, but it seems to us that the existence of chemical peritonitis is definitely settled. Dudgeon and Sargent look upon all inflammatory reactions as due to an organism, and in such cases as we have described, as due to the white staphylococcus. However, we must have a name for it, and even at that we are not so sure that the injection of nuclein, fat, adrenalin, mercury, turpentine, etc., determines the appearance of staphylococci. In our experiments on the knee-joint we found no organisms. The peritonitis due to hæmorrhage (ectopic gestation, etc.) is not an aseptic peritonitis. In every case (save one operated two hours after injury) Dudgeon and Sargent found the white staphylococcus. It is to the action of this organism that the limiting adhesions are due.

The presence of solid particles in the peritoneum is, in itself, not sufficient to produce a peritonitis; the phenomena due to irritation may be present, it is true, but pathologically there are essential differences. The twisting of the pedicle of a tumor, the presence of a sponge irritating the peritoneum, with the consequent reddening and exudation, are the nearest approaches we have to a mechanical peritonitis. These, we believe, prepare the way for bacteria to enter the peritoneum or produce sufficient injury to enable them to gain a foothold after entrance. The association of solid particles with bacteria forms a predisposing element of very great importance, leading sometimes to vicious infections. Kocher described a condition of "implantation infection" in which solid particles are present; in these the degree of sepsis is far greater than otherwise. Spores of tetanus bacilli injected under the skin of animals without injury to the subcutaneous tissues, or the presence of other bodies or irritating suspension media, are destroyed and the animals remain in good health. If, however, foreign bodies be introduced with them a typical tetanus develops. We found, in our experiments, that many micro-organisms injected into joints without foreign bodies produce no inflammatory reaction, while the same culture injected with foreign bodies produces virulent synovitis. It is for this reason that our 4th-of-July injuries are so dangerous — the wadding of the blank cartridges is the counterpart to experimental foreign bodies.

This brings us to the question whether it would not be better to dispense with mechanical irritation in surgery. Are the silk ligatures, and others of non-animal material, factors predisposing to infection? It seems to us, according to the above experimental results, that catgut is the ideal material. It is an animal tissue, easily penetrated by animal secretions and leukocytes, and consequently acts less as a foreign body than some of our other suture materials.

The introduction or penetration of bacteria into the peritoneal cavity is not sufficient to produce peritonitis if that membrane be healthy and free from foreign bodies.

We are all well aware to-day that few, if any, laparotomies are conducted without the introduction of *some* bacteria into the peritoneal cavity, even under the most thorough aseptic precautions. If, however, the peritoneum be previously or concomitantly injured (chemically or mechanically, and certain operative procedures are such) infection readily takes place. This was shown by Walthard, who injected into the peritoneal cavity of rabbits, which had been operated upon to produce a field for the growth by injury in manipulations and drying incident to the operation (a point this writer emphasizes), and produced peritonitis in *every case*, while controls, even when larger doses were injected, failed to produce peritonitis.

Why is this? It would seem that the healthy peritoneum can absorb and destroy certain quantities of bacteria without harm to the host. This is well exemplified in the adhesions one finds about an old healed gastric ulcer, around old appendiceal inflammations, pus tubes, etc. Indeed, here bacterial escape through diseased tissues has had a decidedly beneficial effect in producing encapsulating adhesions. With overwhelming doses of bacteria from cultures there are also their metabolic products (toxins) which, as already mentioned, excite a chemical

peritonitis, destroy the endothelium, giving the bacteria an opportunity to multiply and to become absorbed,— and a peritonitis is the result. In some cases the animal dies even before the bacteria find time to multiply, as was shown by Buxton in experiments already cited, in which the bacilli were destroyed explosively, and yet the animal died, probably being overwhelmed by the endotoxins thus liberated.

In peritonitis without perforation of hollow viscera we assume that the peritoneum is in some way injured or rendered susceptible, and that bacteria reach it either by continuity or by migrating from hollow viscera. An example of this is puerperal peritonitis in which there is in the order given an endometritis, say streptococcic, then a metritis, and finally a perimetritis or localized sub-peritoneal cellulitis, from which it is only another step to a universal peritonitis by spreading. Sub-peritoneal infections are more dangerous than peritoneal infections: First, because the cellular tissue has more rapid absorption and offers less resistance than the peritoneum, and, second, because the cellular tissue does not permit of drainage until abscess formation. The extension may be along the mucosa of the Fallopian tubes and out into the general peritoneal cavity before these have time to close (by inflammation), examples of infection by continuity and contiguity.

The penetration of bacteria from healthy hollow viscera is an unsettled question. Zagari fed dogs with tubercle bacilli and found that they could penetrate into the circulation without a previous lesion of the intestinal epithelium. Of course, this is always open to serious doubts. Who can say that a given intestine is entirely normal? With deranged epithelium it is quite another matter, however, and experimental and clinical evidence is abundant that bacteria penetrate without perforation, in diarrhœas, ulcers with peritonitis before perforation, ulcerative appendicitis, in tuberculous nodules on the serosa of the intestine near a tuberculous ulcer of the intestines, strangulation sacs, etc., etc. Tubercle bacilli are particularly prone to enter the sub-epithelial lymph spaces without leaving any evidence at the atrium of invasion and without gross pathologic changes on the surface, so frequently observed in tuberculous cervical adenitis. In perforations of hollow organs we have a very different state of affairs, everything essential to the production of virulent peritonitis being there. First, we have the chemical products (intestinal ferments, bile, bacterial toxins, etc.) to produce a chemical peritonitis, and, to make assurance doubly sure, foreign bodies (fæces, gall-stones, etc.) to produce mechanical injury, and finally the bacteria, which find a field well prepared for their growth in the chemical and mechanical irritative conditions. Rinne showed that chemical injury is far more potent to reduce peritoneal vitality and predispose it to infection than is mechanical injury.

The violent insult of chemicals from the hollow viscera when such irritating substances as bile, trypsin, intestinal juices, etc., are discharged into the abdominal cavity must not be confused with the mild, almost measurable irritation in the experimental, perhaps soon prophylactic "chemical" peritonitis of nuclein, oils, formalin, etc.

ETIOLOGY

Hæmatogenous or cryptogenetic peritonitis is an extremely rare condition, yet we must grant that it may occur occasionally, but it is not of sufficient importance to consider at length in this paper. This form is most common as a metastatic manifestation or a terminal event in Bright's disease, gout, hepatic cirrhosis, or some other chronic debilitating disease. Modern pathologic teachings lead us to look upon most of these as errors at the bedside or the autopsy table, some minute perforation or traumatic etiological factor being overlooked.

Perforation. Of the perforative forms of peritonitis we cannot help but give the one which, logically, occurs to us first, namely, penetration from without, gun-shot and stab wounds being the types most often presented.

Of the endogenous perforative cases, in which we are most interested, the source of the trouble is by far the most often in the alimentary canal, somewhere from the cardiac end of the stomach to that part of the rectum which severs its connection with the peritoneum; in the alimentary canal we have again two zones of particular danger, viz.: the vermi-

form appendix and the region of the pylorus. These two zones represent the source of infection in upwards of 90 per cent of our cases of diffuse peritonitis.

In some of the fulminating cases of appendicitis the appendix may rupture or indeed slough off entirely before there is any local protective peritonitis tending to wall it off, or the localized abscess may rupture as the result of some slight trauma or more or less active peristalsis.

The perforating ulcerations of the stomach are usually the simple or peptic ulcers, though occasionally carcinomatous ulcers penetrate the stomach wall. Cases are reported not infrequently where the infection in and about the ulcer is so active as to lead to a phlegmonous gastritis with extension to and involvement of the peritoneum without actual perforation. Analogous to this condition is that found in the strangulated herniæ, both internal and external, intussusception, volvulus, and septic embolism of the intestine which produce a partial gangrene or a phlegmonous inflammation of the mucous coat or entire intestinal wall, with migration of micro-organisms and a diffuse peritonitis.

Typhoid, dysenteric, tuberculous, syphilitic, and carcinomatous ulcers of the intestine are occasional causes of this condition.

Traumatic rupture of the intestine, whether subcutaneous or penetrating, is a frequent clinical form of perforation. An element of protection to the patient in these cases is the tendency of the muscularis of the healthy intestine to contract about these openings. It is surprising sometimes to find at operation how little fecal matter has escaped in a case with perhaps a complete transverse separation of the gut, several hours having elapsed since injury, which accounts for the good surgical results secured in perforating wounds when the operation has been performed immediately after the accident, as forcefully illustrated by Harris' fifteen recoveries out of seventeen cases operated within six hours after the accident.

Occasionally foreign bodies swallowed (pins, fish-bones, etc.), cause a "perforative" peritonitis.

Empyema of the gall bladder, or indeed less virulent cholecystitis with cholelithiasis, may lead to peritonitis either by extension or perforation.

Traumatic rupture of a renal cyst or the urinary bladder, even if healthy, is particularly dangerous as the decomposing urine irritates the peritoneum,— infection is only another step. It is in this class that we get the explosive types of absorption.

There occurred in the practice of my colleague, Dr. E. W. Lee, in 1894, a case of large renal cyst filling the left hypochondrium into which an exploring needle had been inserted; its withdrawal was followed by leakage of the urine into the free peritoneal cavity, causing intense pain, great mental anxiety, and hypersensitiveness of the entire abdomen. The patient was immediately taken to the hospital and operated. There was a large quantity of urinary fluid in the peritoneum with intense hyperæmia of the surface, and some fibrinous exudate. The abdomen was washed out, the renal cyst removed, drainage instituted. The patient died thirteen hours after the exploratory puncture.

Liver abscesses, splenic infarcts, pancreatitis, simple or suppurative, are occasional causes of peritonitis, with or without rupture into the cavity.

In the female we have another most potent source of infection, the internal genitalia. The post-abortive and post-partum infections with extension to the sub-peritoneal cellular structures and the infection from the tubes, either through the open ostia or by extension through their substance, are the most common forms. Occasionally perforation of these organs occurs during labor by rupture of the uterus or the vaults of the vagina, or by instrumental manipulations, either during labor or vaginal operations.

Other rare sources of infection are, breaking down lymphatic glands (typhoid for example), suppurating kidneys, suppurative pylephlebitis, infection of the scrotal or penile tissues, with extension along the vas deferens or through a tunica vaginalis incompletely separated from the peritoneum.

CAUSES OF DEATH IN PERITONITIS

In the course of Buxton's experiments with typhoid bacilli the rabbits died in two quite

well-defined periods, which he believes have their analogies in the human afflicted with peritonitis. The animals died either within the first two hours after injection, or death was deferred to or beyond twenty-four hours. However, animals surviving the first critical period usually recovered, a point we shall emphasize in discussing treatment.

Examination of the peritoneal fluid and organs of rabbits succumbing early to the inoculation show a strikingly uniform extensive destruction of the bacteria injected. *The reaction on the part of the rabbit was good.* What, then, has been the cause of death? Presumably the liberation of toxins on the death of so many bacteria resulted in an overwhelming dose of bacterial poison and the animal succumbed. Support is given this by another experiment in which he injected dead bacilli into a vein. Death was early (one-half to one hour) and was clearly due to intoxication, the shorter period being easily explained when one considers that the bacteria were already dead, with the endotoxins perhaps liberated, and that these were injected directly into the blood vessels.

The animal which died after twenty-four hours usually had innumerable bacilli in its peritoneum and organs; death was apparently due to a peritonitis with septicæmia.

In man, Dudgeon and Sargent observed that some died within a few hours and others succumbed in ten to twelve days. This has not been our experience. In peritonitis, traumatic and perforative, the patients succumbed as a rule between the 30th and 56th hour of the perforation; surviving this they lived from six to eight days.

Formerly, many cases dying soon after such an operation were said to have died of "shock." It seems to Buxton (and we fully agree) that these cases died of an overwhelming dose of bacterial toxins, some because absorption was favored, if not actually aided, by wiping, irrigating, and excessive handling and sponging of organs. In others the intoxication had already become so great by delay in operation, that the least manipulation was enough to cause sufficient absorption to produce the fatal effect.

Buxton has made the statement that our dictum, "The primary overwhelming dose of *toxins*" should be paraphrased, "The primary overwhelming dose of *bacteria*."

It seems to us, in the light of the above discussion, that our original statement, "The primary overwhelming dose of *toxins*" is not only justified but strongly fortified by his own conclusions. It is the toxins that are liberated during manipulation which cause so many of our early deaths after operations for appendicitis with general peritonitis, and if previous absorption has not been too great the patient will recover with the same uniformity that our alkaloidal poisoning cases do, if we can but tide them over the acute manifestations.

An important fact corroborating all this is seen in the statistics gathered on streptococcic and colon bacillus peritonitides. The cases of the former die uniformly in 24 to 48 hours; the latter either in the first few hours or not for several days, leaving a gap with few or no deaths, a period corresponding exactly with the lethal period in streptococcic cases.

What is the explanation? The streptococcus generalizes rapidly, whether aided or not by irrigation; it is not rapidly destroyed, hence liberates few toxins; death, therefore, does not occur until it has proliferated sufficiently to cause intoxication by death of the old organism.

In colon bacillus infections (and this is the organism of greatest importance in appendiceal peritonitis) if irrigation be practiced, the bacilli are aided in their rush to the diaphragm and thence to the organs, are rapidly destroyed, and the patient dies of toxæmia, with symptoms not unlike "shock," usually reported as "death from shock." But if bacillary absorption be slight (no irrigation, hence limited diffusion) the poisoning is likewise slight, and the patient "reacts to the shock."

Late deaths in the colon bacillus cases are due to a constant increase of bacilli in the peritoneum (general peritonitis) with absorption of the toxins and possibly of the bacteria, death occurring from a cumulative toxæmia.

The streptococcus deaths are then due to a sepsis, the colon bacillus cases either to the "primary overwhelming dose of bacteria and toxins," or later to a general peritonitis with a cumulative toxæmia.

BACTERIOLOGY

The recent monograph on the "Bacteriology of Peritonitis," by Dudgeon and Sargent, has thrown the former views on this subject into great confusion. Their work was done exclusively on the living subject (at the *beginning* of operations) and it is this which makes it so valuable. All the statistics of the past, nearly all drawn from post-mortem bacteriology, are worse than worthless, for the colon bacillus and other organisms invade the tissues as early as two hours after death, a fact brought out by Tavel and Lanz in their monograph in 1893.

Great importance is attached to the staphylococcus albus, an organism formerly looked upon as a more or less harmless yet ubiquitous invader of all pus infections, especially stitch abscesses, and was found even in aseptic wounds, where it was presumed an aid to healing. The organism is non-pathogenic, or at most of extremely low virulence.

The work of Dudgeon and Sargent establishes for this micro-organism a most important rôle in the pathogenesis of peritonitis. It appears early at the site of trouble, its function being to determine a rush of fluid and leukocytes, which do not degenerate in its presence, as they do in that of the colon bacillus for example. Its origin is technically unknown but there can be no doubt that it comes from the intestine.

This protective function has been proven experimentally as follows: Peritoneal injections of staphylococcus albus and colon bacillus cultures in mixture result in peritonitis; but if the staphylococcus albus injection precede that of the colon bacillus by three hours, peritonitis does not occur. Protection against infection is attributable to the phagocytosis excited by the white staphylococcus (after the initial leukopenia is over), resulting in a local immunity against infection.

It acts not only by promoting a local immunity but it causes sufficient reaction (in itself harmless to the host) to produce agglutinations and adhesions, which tend to limit infection. This statement is not a mere hypothesis, the organism has been found alone in these early fibrinous exudates. In cases of pelvic hæmatocele, this organism was present in every case without exception. Dudgeon and Sargent believe that this organism determined the adhesions walling off the hæmatocele.

It *appears first* and *disappears last* in all abdominal infections of intestinal origin. After the subsidence of an acute attack of appendicitis the staphylococcus albus is present for a long period of time, presumably keeping up a low grade of protective inflammation.

It seems to us that the infiltration of the subperitoneal tissues with its lymphatic cofferdamming is another essential element in the immunity produced by the white staphylococcus, not sufficiently emphasized by Dudgeon and Sargent.

From the presence or absence of staphylococci they draw the following conclusions: "If phagocytes and staphylococci are abundant in a region remote from the focus of infection, the prognosis is good; if bacilli are present with staphylococci and phagocytes, the prognosis is grave but not hopeless; if there are a few phagocytes, few staphylococci, and many bacilli or streptococci the prognosis is grave."

While the organism produced slight illness in experimental animals for a few hours after injection, this may be looked upon as due to the exudate thrown out, for none of the animals died. It is possible that the invasion of hæmatomata by this organism in the human is a cause of the so-called "fermentation fever."

Most peritonitides are mixed infections; especially is this true of the cases which prove fatal. Predöhl found 10 mixed infections in 14 examined, Krogius found 35 mixed, 3 simple and 2 sterile (?) in 40 cases. Frænkel, on the other hand, found 20 simple infections in 31 cases. It must be borne in mind that these statistics depend somewhat upon the methods used in determining the organisms present. Smears are the most accurate, since in culture the organism may overgrow or subdue the rest (e. g., colon bacillus), and statistical inconsistencies result.

The colon bacillus, the streptococcus, the pneumococcus, B. pyocyaneus, the typhoid bacillus, the gonococcus, and the staphylococcus pyogenes aureus are the most important, in the order given. Other more or less saprophytic organisms occur, diplococcus intestinalis major and minor, coccus conglomeratus, B. pyogenes fœtidus, proteus vulgaris and others (Tavel and

Lanz). Bacillus tuberculosis, tetani and mallei, the rays of actinomycosis and anærobic organisms are occasionally found.

The colon bacillus is undoubtedly the most important. Larnelle and Malvoz considered peritoneal infections of intestinal origin as due almost exclusively to this organism, a view not in accord with the facts. Many of the cases cited by them were doubtless in the beginning mixed infections, the associated organisms being later overgrown by the colon bacillus. This property of the organism is well exemplified by the case of Charrin and Veillon. In an autopsy performed 3 hours after death, the pneumococcus alone was found in the exudate. Twenty-four hours later, however, the colon bacillus was found *alone*, the less hardy pneumococcus being entirely supplanted by the proliferation of a post-mortem invader; the case was one of terminal peritonitis with cirrhosis of the liver. In Krogius' series the colon bacillus was present in 35 of 38 cases.

Its virulence depends to some extent upon the location of the perforation, the condition of the bowel, and the pathologic changes responsible for the peritonitis. Klencki's experiments show that the colon bacillus is least virulent in the jejunum, most so in the ileum, and intermediately so in the colon; hence the colon bacillus in the ileo-cecal and appendiceal region is from the intermediate to the most severe virulence. Corner states that bacterial activity is at its maximum in the region of the cæcum. Its virulence is increased greatly in diarrhœas, and in the lumen of a strangulated gut. We believe that its virulence is greatly increased by its development under pressure. It is to be remembered that the colon bacillus is present in every perforative peritonitis, not as one well-defined organism but represented by several strains, usually of varying virulence and even morphology and cultural characteristics.

"In peritonitis we consider that certain bacilli of the colon group are the most important, the most common and not infrequently the most virulent of the organisms which are known to cause peritonitis." (Dudgeon and Sargent.)

The colon bacillus may remain in a quiescent appendix long after the attack, and because of the retention show a tendency to become virulent. Hence such an appendix may lead to a fatal peritonitis if precautions against infection are not taken.

The streptococcus pyogenes variety of peritonitis is an extremely fatal though not necessarily hopeless one. In appendiceal perforations it is fortunately not so very often present. A. O. J. Kelly found it once only in 94 cases, Krogius once in 40 cases, Low and Lartigau, on the other hand, found it in 81 per cent and 75 per cent, respectively, of cases of acute appendicitis (3 and 4 days in duration). E. M. Corner and Harvey Cushing state that the streptococcus is a widely distributed organism, but is usually lost in artificial culture, and that it is a much more common cause than supposed. The great diversity of percentages of bacterial findings, are, we believe, attributable to the fact that many observers make their cultures and smears from the fluid in the peritoneal cavity while others take them from the surface of the organs and peritoneum. These two methods would give entirely different findings. Dudgeon and Sargent failed to find streptococcus in a single instance of non-perforative diffuse peritonitis due to appendicitis, and we found it only once in pure culture, this case having the greatest leukocyte reaction (80,000) in our entire series. The gynecologist frequently encounters it in post-partum infections when its virulence seems to be especially great, probably because it is then a sub-peritoneal cellulitis, a condition peritoneal drainage does not benefit, as it is analogous to a hypodermic injection into the cellular tissues of the pelvis. Its tendency to spread rapidly to septicæmia has already been mentioned.

Pneumococcic peritonitis is rather rare, especially in adults and even more so in the male, but cases are being reported with increasing frequency. It is rather common in female children, where it gains entrance through the Fallopian tubes, and is then often limited entirely to the pelvic peritoneum. In 33 cases of pneumococcal peritonitis collected by Quèhart, 27 were in girls and 6 in boys. Dieulafoy states that the invasion in pneumococcal peritonitis is characteristically sudden. We found it in one of our patients (case cited later).

Ghon reports several cases of this etiology, 3 following perforation of the stomach in ulcer or carcinoma, and a fourth occurring in a patient with carcinoma of the stomach without perforation; one of the cases had a coincident pneumonia. He stated that Jensen isolated the pneumococcus in 3 cases following perforative gastric ulcer and that Brunner collected 22 cases of perforations of gastric ulcers in which bacteriological examinations had been made, 4 showing the pneumococcus. This is probably due to the fact that the saliva, which so frequently contains pneumococci, is swallowed; the organisms then pass through the perforation before the gastric juice has had time to destroy them.

Cases are commonly reported of pneumococcal peritonitis, hæmatogenous in origin, secondary to pneumonia.

The organism has been found in the exudate of peritonitis due to appendicitis by Veillon and Zuber. It was isolated once by Dudgeon and Sargent from an appendiceal abscess they do not look upon it as an important organism in appendiceal peritonitis, however.

Fraser and Bowen report a series of 16 cases in children, and conclude that it is a rather rare disease and that it is secondary to some other pneumococcal lesion in one third of the cases. In the other two-thirds it is probably infected from the bowel. It is a very fatal form of peritonitis.

Ashdowne reports a case of primary pneumococcal peritonitis in a woman. The abdomen was opened and no perforative lesion found; it was flushed and drained. Death followed in a few hours. He has collected 31 cases from the literature, some cited above. It is associated with diarrhœa, great mental excitement, and an odorless pus.

Cases of this etiology are being reported with increasing frequency since the laboratory work is carried out more carefully.

The bacillus of blue pus (bacillus pyocyaneus), while not a common cause of peritonitis, becomes important because of its variable, often great, pathogenicity. It was formerly considered non-pathogenic, and as it is a normal inhabitant of the intestine, under favorable circumstances it may become a cause of peritonitis; it is usually very virulent, being second only to the streptococcus. Green or blue pus is never produced in the peritoneal cavity, as access to free air is essential to the formation of the pigment pyocyanin. It is a curious fact that this organism is never found in mixed infection with the colon bacillus. An experimental symbiosis is also difficult of attainment.

Gonorrhœal peritonitis is a type the existence of which has been contested by many pathologists; there are, however, numerous clinical cases reported. Wertheim (quoted by Cushing — see below) showed by culture and inoculation that gonococci can produce a localized peritonitis. Cushing published two cases in which he found the gonococcus *alone*. Hugh Young has also reported cases. Charles Goodman recently reported a case and gives the literature of the subject.

It may be true that the pure culture type in the female is of mild virulence, but the clinical fact remains that a peritonitis metastatic from a gonorrhœa may be extremely virulent. In November, 1880, the author observed his first case of that character in the male in an ordinary gonorrhœa of the third week. The patient had a mild chill, the following day had effusion in both knee-joints, 48 hours later intense pain in the abdomen and great effusion, and the following morning effusion in both pleuræ, 48 hours later cerebrospinal meningitis, pericarditis, and final coma and death. The amount of pus in the abdomen was very great, not offensive, and resembled that in the joints and pleura.

The staphylococcus pyogenes aureus as a cause of peritonitis clinically is rare. It occurs most often in penetrating wounds of the abdomen and as an accident in experimental work or after operation where the technique has been faulty. Flexner's statistics bear out these statements. Dudgeon and Sargent are not convinced that the staphylococcus pyogenes aureus is so very rare in peritonitis. They look upon the group of staphylococci much as they do upon the colon group, with variations from one end of the line of pathogenetic properties to the other of the non-pathogenic albus variety.

Veillon and Zuber supposed that they had sufficient evidence to show that anærobic organisms are important causes of appendicitis.

Tavel and Lanz in the irmore recent work arrived at similar conclusions. The organisms were frequently found in the pus of abscesses and in the peritoneal cavity in peritonitis. They believed that the gangrene and offensive odor were due to these organisms.

Dudgeon and Sargent do not give anærobes as important a place, finding a representative only once, the B. ærogenes capsulatus (B. perfringens of Veillon and Zuber, and "one of the B. of malignant œdema" of Tavel and Lanz). In our experience anærobes, and especially ærogenous varieties, have been very rare.

In typhoid perforations the peritonitis is not often due to the typhoid bacillus, as one might expect, but most often to the colon varieties, occasionally streptococci, etc., therefore in dealing with typhoid perforative peritonitis we are dealing essentially with colon bacillus peritonitis without additional virulent microorganisms, as we formerly believed, and to which we attributed the almost uniformly fatal result.

Peritonitis is dangerous directly in proportion to the absorption. It is not the inflammation of the peritoneum that is fatal, but the toxins which are absorbed from its products that cause the severe manifestations or perhaps death.

The question arises, does an inflammation accelerate or retard absorption from this cavity? The latter was believed by many to be a prerequisite to the production of peritonitis. Much experimental work and writing has been done on this subject but with inconclusive, yes, often contradictory, results.

Schnitzler and Ewald, after numerous experiments, in which potassium iodide and potassium ferrocyanid were injected into the peritoneum in both the absence and presence of experimental peritonitis, concluded, on timing the *appearance* of the chemical in the urine, that absorption is slowed in the presence of infection. Chronic irritations (the long carrying of glass marbles) had a similar result.

Clairmont and Haberer took exceptions to some of their conclusions and undertook the same work with diametrically opposite conclusions, drawn from the time of *final disappearance* of the chemical from the urine.

Finally, the most recent and exhaustive work on the subject is that of Glimm. His work was entirely quantitative, using lactose as the injected material and estimating the time of quantitative excretion in the urine of the material injected. Peritonitis was induced by an especially virulent strain of colon bacillus and always on animals in which the normal absorption time had been estimated about three weeks previously for control. His conclusion agrees, in the main, with that of Clairmont and Haberer, viz.: that absorption is accelerated in peritonitis.

There can be no doubt of the accuracy of his deductions so far as his work is concerned, but the great error in his work is that *all* of his experiments were carried out within the first 14 hours of peritonitis. *But what is the state of affairs later, in advanced peritonitis?* Clairmont and Haberer, it is true, concluded from one or two experiments, in which the animal died rather quickly, that in "advanced peritonitis absorption is slowed," a statement contradicted by Glimm.

What is the clinical experience in this matter? As early as 1896, at the meeting of the American Association of Obstetricians and Gynecologists, we stated that there is *an early acceleration*, with a *later slowing of absorption* in peritonitis. J. C. Munro agrees with us in this statement. If we can but tide our patients over this period of acceleration of absorption all will be well. The peritoneum resembles all other structures in the body in these particulars; immediately after abrasions, lacerations, and excoriations absorption is rapid and at its maximum; as time passes and the lymph spaces become coffer-dammed and filled with leukocytes and later cell proliferation and œdema block the spaces, absorption becomes less and less until it is practically *nil*, as recognized in the walls of old abscess, floors of granulating wounds, etc. Every old inflammatory base offers great resistance to infection. Therefore time is an important element in the development of local immunity.

The experimental laboratory has its limitations, in the greater difficulty of drawing conclusions from results on animals, in the limited number of experiments, always under artificial conditions, and in the impossibility to isolate

the peritoneal sac and then study the afferent blood and lymphatic vessels to determine absorption time.

In drawing his conclusions, Glimm overlooked the fact that he had studied no advanced case of peritonitis (14 hours after injection of the colon bacillus being the latest). And, further, in drawing conclusions from urinary excretion of the substance injected, the influence of febrile oliguria, splanchnic hyperæmia, with concomitant lowered blood pressure, as well as other modifying conditions, were of necessity disregarded. One of his experiments (in the animal that died in 5½ hours — No. 24) with no sugar in the peritoneal cavity, and only 1.7235 g. (of 2.4 injected) excreted in the urine, in a period of time in which the same animal when healthy had excreted 1.965 g., substantiates this statement. If we consider that the peritonitis was *advanced* because the animal died, our stand that absorption is delayed in advanced cases is fortified. The fact that there was no lactose in the peritoneum in no way alters the case, since we do not know when the peritoneum was free from sugar in the animals which survived. Lactose being soluble in water, it is granted that such a substance is absorbed into the blood in a large measure. Whether bacterial absorption (an element of considerable individual importance), which is manifestly by way of the lymph chiefly, is affected similarly remains to be proven. As a matter of fact, researches yet to be spoken of tend to show that "reactions" (inflammation) slow bacterial absorption from the first.

Another error in experimental work of this kind is that all the work so far has been done with an *exhaustible* supply of substance in the peritoneum. In peritonitis the supply is for the time being *not only inexhaustible*, but constantly being *augmented*. If we could but find a way to measure pus absorption in these animals, or, so long as this is so difficult of accomplishment, could find some way of keeping the quantity of experimental indicator constant in the peritoneal cavity, another story might be told when the experimenter draws his conclusions.

Is this increase of absorption beneficial to the patient? If our statement that peritonitis is dangerous in proportion to the absorption be true, it must be detrimental, at least from the standpoint of intoxication. Does it lessen the process locally, i. e., does it exert a beneficial effect by carrying away bacteria and toxins, lessening the local process and giving the entire body forces the opportunity to take part in the defense? It seems to us that Peiser has most aptly discussed the question and arrived at conclusions that are logical. As we have seen, the toxins are absorbed chiefly by the blood, and the bacteria *soon* reach the blood by way of the lymphatics. The phagocytes and alexins are then compelled to do battle *in the blood*, and each unit vanquished in this skirmish is a unit less to oppose the bacteria and toxins in the battle-royal in the peritoneum. The conclusion, it is true, is largely theoretical, yet its truth can scarcely be called into question.

With this, too, vanishes the old idea that a slowing of absorption is necessary for the production of peritonitis.

It may be well to mention here the work that has been done recently in increasing peritoneal resistance to infection by injection of various substances into the peritoneal cavity.

Issaeff is, perhaps, the first investigator along this line; he noted the efficiency of normal salt solution and nucleic acid injections as early as 1894.

Exner was the next to do work of value. He found that intraperitoneal injections of adrenalin, 9.45 minutes before introducing poisons (strychnine, physostigmin, potassium cyanid), protected the animal against doses of these poisons which were uniformly fatal in control animals. His work has been severely criticised by Wells and Mendel and Meltzer and Auer because of various inaccuracies, but it seems to us that the protection afforded animals against alkaloids and potassium cyanid are prima facie evidence of a protective influence of adrenalin injections, be their technical and quantitative errors what they may.

In 1904, Klapp presented to the *Chirurgische Kongress* the fact that mucoid material and fats injected into the peritoneal cavity slow absorption, presumably by blocking the lymphatics.

From this time on, the literature is replete with articles on this subject. Mikulicz found

that injections of aleuronat and nucleic acid were more efficient than bouillon and salt solutions, and, further, that nucleic acid is more efficient in producing a leukocytosis, both local and general, than aleuronat. There is, at first, a leukopenia, perhaps analogous to the initial leukopenia of Buxton described under his typhoid experiments, followed in several hours by a hyper-leukocytosis. This was sufficient to protect guinea pigs against 16 to 20 times the minimum lethal dose of colon bacilli. Mikulicz was still working on this problem just before his untimely death.

Borchardt confirmed Issaeff's work with similar experiments, and, in the main, agreed with Mikulicz. He found that resistance was greatest 48 hours after the injection, disappearing gradually in about 3 days ("resistance period").

Diez and Compara found that 1 c.c. of a 5 per cent solution of nucleic acid introduced 24 hours before injection protected guinea pigs against 12 times the fatal dose of colon bacilli; it afforded some protection when given only 3 to 4 hours before the bacteria.

Glimm has recently used olive oil, lanolin, etc., to protect the peritoneum. His calculations were made by plating blood taken from the carotid artery at varying intervals, after intraperitoneal injections of bacteria. He found that the protection afforded was enormous — rarely did his "protected" animal die except as a result of mishap. After proving experimentally that his oils had no inhibitory effect upon the growth of colon bacilli *in vitro*, he concludes that the absorption is hindered probably by mechanical occlusion of the lymphatics (doubtless assuming the presence of the stomata). Inasmuch as he found olive oil more protective than a colon serum, his work is of very great clinical significance. He states that he "would not hesitate" to inject several c.c. of camphorated oil into the peritoneal cavity of a profoundly toxic case of peritonitis.

Buxton and Tracy have repeated many of these experiments, especially those with nucleic acid and olive oil. In the former they used 3 c.c. of a 5 per cent solution of nuclein. They noted at first a fall in temperature and leukocytes, then a gradual recovery of the body temperature and a leukocytosis (slower than in Mikulicz's experience). The post-mortem showed marked peritoneal "reaction"; the omentum was thickened and congested, the leukocytes were present in large numbers, chiefly the polymorphonuclears; macrophages were also present.

In animals protected by this injection there was approximately only the 1–100 invasion of the organs by the colon bacilli as compared with unprotected animals. Undoubtedly, many bacilli were taken up at once by the many leukocytes, preventing invasion. Curiously enough, the omentum did not seem to be as efficient a policeman in its swollen state as did the omentum of the unprotected animal. The anterior mediastinal glands (the route by which bacteria reach the blood) were swollen and congested, but bacilli were very scarce. It is probable, therefore, that nuclein protects by the local "reaction," i. e., inflammation, possibly the subperitoneal infiltration occludes or coffer-dams the lymphatics, as we demonstrated in the injection of a 2 per cent solution of formalin and glycerin into joints.

They repeated Glimm's fat experiments by using olive oil stained with Soudan iii. The result, i. e., diminution of absorption, is the same as that of Glimm, but they found red fat droplets in the lymphatics of the diaphragm and anterior mediastinum, few, it is true, and conclude therefore that fat acts the same as nuclein by producing a "reaction."

Of course all this work is new and comparatively untried. It gives us food for thought and it is possible we will soon have added a valuable method of guarding against peritoneal infections by prophylactic injections before opening an abscess or opening infective hollow viscera. As a means of treatment we must look upon it *sub judice*.

Willis G. MacDonald presented to the State Medical Society of New York, experiments showing that subcutaneous injections of sodium nucleinate caused an artificial leukocytosis. He has actually made use of this to protect against infection in street wounds, etc., where inoculation is certain, with what he believes decided value. In a little girl in whom a volvulus had ruptured it seemed to him to have been a life-saving measure. Vaughan applied this treat-

ment first in the human being, making subcutaneous injections of nuclein in cases of tuberculosis "with beneficial effect."

In all this we have added experimental evidence, though not conducted for that purpose, that early absorptive increase is not beneficial but detrimental to the life of the experimental animal, a conclusion we feel is amply sustained by clinical experience. The above may be cited as evidence in rebuttal of Lennander's statement that the danger in peritonitis is greater if absorption of bacteria be lessened.

PATHOLOGY

As expressing the extent of the process, the terms now in use are very much at variance. An infection in the peritoneal cavity limited by adhesions, be they ever so delicate, is a circumscribed abscess or peritonitis, depending upon the presence or absence of pus. An appendiceal abscess may extend to the diaphragm above and to the sigmoid on the left, filling over one-half the entire abdominal cavity, and yet not be considered a diffuse peritonitis because it is circumscribed by adhesions, as illustrated in the author's cuts in Keen's "Surgery." Where there are no adhesions of any kind, the peritonitis is of a *spreading* nature, a term expressive of its tendencies, and does not carry with it the idea of extent of involvement. *Free* peritonitis is simply another way of stating that the condition is not a localized abscess or circumscribed peritonitis; this also fails to convey any idea of extent of involvement. The terms *diffuse* and *general* have given rise to considerable discussion as to their exact contradistinction. Some writers consider the terms of identical meaning as regards extent of inflammation of the peritoneum, others look upon *spreading* and *diffuse* as synonyms, reserving the word *general* for those rare cases in which the entire peritoneal surface has become involved.

Inasmuch as an involvement of the *entire* peritoneum could be determined only at necropsy such discussions are academic. It must be admitted that the impression as to extent of involvement, gained at the operation, may be erroneous. The absence of limiting adhesions, however, can be determined with great accuracy on the operating-table, and it is this that justifies, clinically at least (in distinction to a post-mortem term), the application of either diffuse or general to extensive free or spreading peritonitis. Therefore the term *free peritonitis* should be used for the general diffuse variety and *circumscribed* for the encapsulated form, regardless of the size. Statements have been made to the effect that cases never live until the process becomes general, or that it is a physiological impossibility for a case of general suppurative peritonitis to recover,— all of which goes to show that the term has been misunderstood. We do not believe that the term was ever intended to mean (clinically) that every square millimeter of membrane was involved.

According to the condition of the peritoneum and the nature of the exudate, peritonitides are described pathologically as diffuse septic and diffuse suppurative, and to each of these other qualifying terms designating some particular pathologic change may be added, e. g., putrid, serous, fibrinous, fibrino-plastic, gangrenous, etc.

Diffuse septic peritonitis is the pathological variety usually due to the streptococcus. It seems that this organism in its growth in the peritoneum is characterized by (a) a tendency to produce relatively large quantities of toxins, and (b) very little plastic exudate, and (c) by a tendency to penetrate the subserous lymph spaces. The serous element is usually very small.

In cases of puerperal origin, the process is primarily a *subperitoneal cellulitis*, the peritoneum loses its lustre, is much thickened and œdematous, occasionally it may show on its surface ineffectual attempts at plastic formations of fibrin shreds, petechiæ, or considerable bloody extravasations may occur as a result of inflammatory injury to vessel walls. It is the *subperitoneal* character of the process that makes this form of peritonitis so fatal. The peritoneum has enormous defensive powers, and when aided by incision, recovery is the rule. In this form, however, the peritoneum has exactly the opposite effect, confining the inflammation to a tissue of low vitality and great absorbability and preventing drainage of any kind when incision of the peritoneum is practiced.

Where the streptococcus is the cause of a perforative peritonitis, the process resembles more closely that of other organisms. The relative failure of plastic processes is still evident, the peritoneum is dull or even rough, the capillaries dilated, often sufficient to decidedly redden the membrane.

The streptococci readily and rapidly pass through the lymph spaces and vessels into the general circulation — a long-established clinical fact. This rarely occurs with other pathogenic organisms, again emphasizing the danger of absorption and showing its gravity in prognosis. (This point has been discussed previously.)

Sometimes a distinct fibrino-necrotic membrane is formed similar to the diphtheritic exudate which is "shed" later; the subperitoneal lymphatics and blood-vessels are then exposed to absorption of large quantities of toxins, death ensuing an hour or two after this incident. This absorption resembles the acute intoxications of diphtheria following the exfoliation of the original membrane.

In the less severe processes the exudate may be of the serous or sero-fibrinous character. This last form of streptococcus infection we believe to be amenable to quite uniformly successful operative treatment. It is at this point that we wish to take exception to Dudgeon and Sargent's statement regarding treatment, that "it is doubtful whether any surgical procedure offers a prospect of success (in streptococcic cases), but if there is any chance, it must lie in the *most thorough possible washing*." They have doubtless condemned every case of streptococcus infection without due regard to the pathology of the case. It would seem to us that there are three distinct pictures: (1) The puerperal type — peritoneal washing is utterly worthless; (2) the membranous type — washing might be useful could it be done *at the moment of desquamation*; (3) the perforative peritonitis due to the streptococcus — washing is no more justifiable in this than in a colon bacillus infection.

It is to be borne in mind that septic peritonitis, under special conditions of virulence or lowered resistance, is caused by other organisms than the streptococcus.

In the *suppurative variety* the early loss of peritoneal lustre and capillary dilatation is the same as in the septic type, the cloudiness progresses to a greater extent perhaps, migration of leukocytes in varying degree and serous exudation occur, and a *purulent exudate* is formed in quantities varying from a dram to many pints. The primary effusion we consider defensive in that it contains an army of phagocytes and dilutes and prevents absorption. It must, however, be removed by drainage, or secondary toxic absorption will take place.

In opening the abdomen in a case of suppurative peritonitis the deeper layers of fat are often found œdematous, and the thickened injected peritoneum is evident before the cavity is opened. Free gas may be present.

The intestines are distended with gas and fluid, a condition not well understood. It is probable that this is due largely to the injury of the nerves by the subperitoneal infiltration resulting in a paralytic relaxation of the muscle coats and a paralytic intestinal secretion analogous to the paralytic salivary secretions after nerve division.

This distension often leads to trouble for the operator who eviscerates, in that the distension is progressive, and at the end of the operation he finds that he cannot replace the bowel, necessitating the dangerous procedure of incising the intestine to permit the escape of gas, and when the intestines are replaced they are under such great tension that gravity drainage of the cavity is impossible — another contraindication to evisceration and flushing.

Lennander has found changes in the ganglion cells of Auerbach's plexus in cases of acute peritonitis with much distension.

When distension is prolonged, gangrene of the intestine may take place. The stasis produced by the paresis favors absorption of enterogenous toxins, adding materially to the septic symptoms as in prolonged mechanic ileus.

In patients who resist the toxæmia for 24 to 36 hours, or in whom the infection is relatively mild (probably also a matter of resistance), the subperitoneal tissues become infiltrated, much like that about a felon, for example, the lymphatics become occluded, and the perivascular spaces are filled with leuko- and lymphocytes, absorption is slowed, the general peritonitis is a *large circumscribed abscess*, if the term may

be permitted, because of the infiltrated cofferdammed wall, and incision is all that is necessary for recovery.

Where the process is most active and the destruction of endothelium greatest, analogous to a third-degree burn of the skin, the tendency to adhesions is greatest; these are often permanent. Adhesions, the result of organization of fibrinous exudate, disappear when the exciting cause has ceased to act; on opening the abdomen in the course of six weeks, one is surprised to find they have disappeared and the endothelium smooth throughout the cavity.

SYMPTOMS

In perforative cases the first symptom is *pain*, which *comes on suddenly*, is intense and paroxysmal in character, at first localized, low down in the abdomen in intestinal perforation, high up or even in the back in gastric perforation; shortly it becomes generalized. It may be so severe that collapse is imminent. Chilly sensations or an actual rigor are not uncommon.

Primary reflex nausea and occasional emesis immediately follows the pain of perforation.

Tenderness is marked, at first localized at the seat of perforation, but as the inflammation advances, becomes general. The abdominal muscles become rigidly contracted, with absolutely no respiratory movement; exceptionally this muscular defense is wanting, possibly an indication of mild infection.

The pulse is rapid, small, and has a peculiar *hard, wiry* character in the early stages. As the toxæmia increases the pulse becomes softer, irregular, and finally fails entirely. The pulse is a more reliable guide as to the patient's general condition than the temperature.

The position assumed by the patient is quite characteristic, the thighs are drawn up, and, if possible, the shoulders elevated; the respiration becomes very superficial and *costal* in type.

The temperature, at first, falls; this is of short duration; it is associated with blanched lips and a cold sweat or dampness of the skin, especially of the forehead and chest. It soon rises, however, and may reach 104° or 105° in septic cases. This may, however, subside to normal or subnormal. It need scarcely be repeated here that the temperature is of little prognostic or even diagnostic value, except that there is always elevation at some time in the course, usually early.

Nausea is an early and important diagnostic symptom, occurring shortly after the onset of pain; it disappears to return later, associated with distressing vomiting, finally only a gulp occurring every few minutes. At first the contents of the stomach are ejected; then a yellowish green, very bitter fluid is expelled, followed finally by a brownish black liquid with a slight fecal odor. It is probable that a certain amount of the toxins absorbed are thrown into the gastrointestinal canal and that the vomiting is an effort of Nature to eliminate them. In these cases gastric lavage should be practiced for the comfort of the patient, for the vomiting is extremely distressing; the gastric lavage is a therapeutic measure against the intoxication. Early diarrhœa occurs and may be interpreted in the same manner. The tongue becomes dry-coated and tremulous, the teeth covered with sordes.

The abdomen gradually becomes distended, tense and tympanitic, without borborygmus, often entirely obliterating the anterior liver dullness, due in such cases to escape of gas which lifts the abdominal wall from the liver.

The picture is characteristic in the fully developed cases, the posture, the rapid, *hard* pulse, the facies, drawn, anxious expression, with sunken eyes, sharply defined nose, hollow temples, and cold, parched, lead-colored skin, with incessant nausea and vomiting are simulated by nothing else. The peritoneal effusion may occur, but is rarely demonstrated, except by piano percussion.

The patient becomes exhausted, and as the toxæmia becomes greater the heart fails, the vasomotor center is paralyzed, the pulse becomes weak and more rapid, the breathing shallow, and the capillary cyanosis marked; death occurring in from two to five days, or even earlier in profoundly septic cases. The urine is scanty, dark-colored, and contains albumin and indican, either febrile or due to a toxic nephritis.

In typhoid fever, when the patient is in the apathetic state, the onset may not be observed unless the pulse and abdomen be closely watched.

The acuteness of the symptoms depends

somewhat upon the location of the infection. Lenanndler has shown that an infection of the peritoneum in the central zone of the cavity may spread extensively over the small intestine without pain (this is especially true if limited to the visceral peritoneum).

In the streptococcic cases a general hypersensitiveness, with exaggerated reflexes and active delirium, suggest, by their toxins, a stimulating action upon the cerebrum.

DIAGNOSIS

The typical case, with pain at the onset, nausea, tenderness, fever, Hippocratic facies, abdominal rigidity, vomiting, and symptoms of collapse should be readily recognized, as the symptoms occur practically in this order; collapse is always a very late symptom, never an initial one.

The history of previous abdominal or digestive disorders is in these cases of the greatest value, often giving a clew to the origin or cause of the perforation, as in gastric or duodenal ulcers a perforation never occurs without antecedent digestive disturbances.

The clinical picture of appendicitis may have preceded the onset of perforative manifestations for hours or days; such cases are seldom mistaken. The errors of management in appendicitis are made especially when a procrastinating course is being followed, when the pain ceases, the temperature suddenly drops to 99° or such a matter, and the entire appearance of the patient is better. This is often erroneously interpreted as a sign of subsidence of the inflammation, and a hopeful if not absolutely good prognosis is made. To the man of experience, such a picture is alarming, suggesting a cessation of absorption, either from a complete gangrene of the appendix, a perforation, or the discharge of the pus into the intestine,— at the moment of the occurrence we are unable to positively differentiate. In a few hours the patient complains anew of severe pain and nausea, later vomiting, and the abdomen becomes rigid and sensitive.

Another difficult and dangerous condition is the appendiceal abscess which the surgeon has left "until to-morrow," for his greater convenience. The patient becomes restless during the night, and is awakened by a sudden, severe pain in the abdomen, the symptoms growing progressively worse, accompanied by nausea and vomiting. The mass in the right iliac fossa has disappeared, abdominal rigidity is established,— the patient has a general peritonitis.

Preceding gastric symptoms must, at all times, be inquired into. We believe that in practically no case of perforating gastric ulcer has the patient been entirely free from gastric disturbance of some kind. Usually the picture has been classic. In duodenal perforation there is occasionally a history of gastric distress or pain two to four hours after meals, which could uniformly be relieved by a fresh ingestion of food. The attack begins with a sudden, severe pain in the right side, accompanied by nausea and vomiting. The tenderness extends from the costal arch to the pelvis; the temperature goes up, as well as the leukocytosis. The whole picture is quite like that of acute appendicitis, indeed, that is the most common pre-operative diagnosis, as it was in one of my cases in which Drs. Roswell Park and A. D. Bevan were present. In Moynihan's collection of 51 cases, 19 were operated on the diagnosis of acute appendicitis, and in only 2, one of them his own, was a correct preoperative diagnosis made.

In general, the early diagnosis of peritonitis is based on the symptoms: pain, nausea and vomiting, localized tenderness, circumscribed flatness *on piano percussion*, abdominal rigidity, elevation of temperature, leukocytosis, and absence of borborygmus.

In women the gynecic history must be carefully elicited, bearing in mind that an ectopic pregnancy or rupture may closely resemble an infectious process. The menstrual history, preceding pregnancies or abortions, vaginal discharge, and the presence of urethral or other evidence of gonorrhœal infection must be considered.

In typhoid fever, differential diagnosis is often difficult in the extreme. The patient is dull and apathetic; the sensorium is benumbed; he may not express pain; tympanites, which perhaps has actually determined the perforation, is already present, and *unless the pulse and abdomen be closely watched* a perforation may be overlooked, and the patient's only

chance of life be lost. The early fall in temperature, the rigid abdomen, the nausea or vomiting, and the rapid pulse with a tendency to sweat are then the only evidences. Leukocytosis may fail in the general tendency toward leukopenia as was frequently observed in the recent epidemic at Cook County Hospital, Chicago. When it does occur it is of great value. It is well to be on the alert for perforative symptoms after the tenth day of the fever and well into convalescence.

In the less toxic cases, where the patient's mentality is brighter, the sudden, severe pain, followed immediately by nausea, is present in the large majority of cases. Tenderness, beyond that ordinarily present, and vomiting are quite frequent. Rigidity is not so pronounced early in typhoid perforation. It must be borne in mind that a peritonitis can occur without perforation. We have operated on two severe peritonitis cases of this class; both recovered under this treatment; they are not, however, included in this series, since they were not perforative. In typhoid perforation the peritonitis is produced by the colon bacilli rather than by the typhoid bacilli, and should give the same results as are obtained in appendicitis with colon bacillus infection of the peritoneum.

The diagnosis of peritonitis of hæmatogenous origin, or other than gastrointestinal or appendiceal perforation, depends upon careful analysis of preceding symptoms and the examination of the patient. The possibilities are too great for the scope of this paper.

A means of diagnosis, and possibly of prognosis, too often neglected, is leukocytosis — *especially* the *differential* count; in a general suppurative peritonitis the leukocyte count is more often over 15,000 than below. A differential count, however, is of even greater value. "The increase in the relative number of polynuclear cells is an indication of the virulence of the intoxication, and the degree of leukocytosis is an evidence of the body resistance toward the infection. . . . . Purulent infections were rarely, if ever, present with low polynuclear percentages irrespective of the height of the leukocyte count, while very high polynuclear percentages indicated their presence even if the total leukocyte count was low." (Sondern.) This statement has been made in almost exactly the same words by Albrecht, who, however, did his work independently. This work in the main has been verified by Gibson and Noehren, and corresponds fairly well with our experience; unfortunately these are not of negative value. Many operations for diffuse purulent peritonitis might be postponed for the surgeon's convenience were a low percentage of polynuclear leukocytes made the basis for such procrastination, as cases with a low percentage do occur rather frequently in the face of extensive spreading infections. However, in the face of a high percentage, e. g., 90 per cent, operation should *never* be deferred; below 78 per cent the condition is fairly safe for a few hours postponement. Counts between these are a source of perplexity for the operator. However, the simple rule we have followed is the best, "Operate as soon as possible on every case."

DIFFERENTIAL DIAGNOSIS

The differential diagnosis between peritonitis and perforative, free, spreading peritonitis cannot always be made preceding the incision, but as severe peritonitis is practically always a surgical condition, the differentiation is not so important except in special cases, as pericholecystitis, perisalpingitis, etc., and in these latter differentiation is comparatively easy.

Intestinal Obstruction. A mechanic ileus, especially if due to strangulation, may closely simulate peritonitis, and if the patient has had previous symptoms leading to a suspicion of gastric ulcer or appendicitis, the case may be puzzling. The presence of stormy peristalsis or borborygmus with absence of fever may be considered pathognomonic, as this *never occurs in the adynamic ileus of peritonitis.* The absolute coprostasis and the more persistent, later, "fecal-colored" vomiting are equally manifest in peritonitis. Leukocytosis is usually absent in mechanic ileus, though MacDonald has reported a case of mechanic ileus, with a leukocyte count of 35,000.

Thrombosis of mesenteric vessels closely simulates a perforative peritonitis, and a correct diagnosis is rarely made intra-vitam.

Rupture of an abdominal aneurism, hæmorrhagic or gangrenous pancreatitis, acute entero-colitis, phlegmonous gastritis, Dietl's

crises, and various colics may lead to diagnostic difficulties; but a careful analysis of the chronology of symptoms and accurate use of the instruments of precision with the physical signs will lead to a correct or at least to a correct operative or non-operative conclusion.

Ruptured ectopic gestation would scarcely be mistaken. The irregular intermittence, elongation of interim, or cessation of menstruation preceding the acute onset arouse suspicion. Later there are irregular colicky pains in the lower abdomen for a few days or weeks preceding the acute manifestations; with signs of internal hæmorrhage,— explosive in character; free peritoneal fluid, the absence of temperature, the softened enlarged uterus, with a mass in either fornix and the finding of decidual cells in the discharge; this syndrome confirms the diagnosis.

Acute pancreatitis in one of its three forms may be very difficult of differentiation. The pain located high up in the abdomen, usually a mass in the epigastrium with muscular rigidity, early hiccough and dyspnœa, and cyanosis with collapse are suggestive, and may lead to the diagnosis. When the abdomen is opened, the plaques of fat necrosis indicate the diagnosis at once; these gray patches are occasionally misinterpreted as tuberculous.

Acute toxic or phlegmonous gastritis with great pain, persistent nausea, and vomiting with profound collapse and abdominal tenderness with muscular defense are very misleading, but a knowledge of the etiology would lead to differentiation.

Pneumonia (especially in children) has caused many needless laparotomies; careful examination of the chest in all cases would eliminate this error.

From the above descriptions one might imagine that *all cases* of perforative peritonitis presented *grave symptoms in the early stage of the disease*, while the clinical facts are that surprisingly few grave symptoms were present to indicate the seriousness of the situation in occasional cases,— e. g., a young man with a direct appendiceal intraperitoneal perforation of 8 hours duration, with a large quantity of pus free in his peritoneal cavity, walked into the operating-room with his physician, he complained of no severe pain but of distress in the abdomen his leukocyte count was 34,000. Diagnosis of perforative peritonitis was made. His appendix was perforated by a fæcal concretion; there were no limiting adhesions; and the peritoneal cavity contained a large quantity of offensive fecal pus. In some cases free, purulent, perforative peritonitis was not suspected until the abdomen was opened. True, the symptomatic mild cases all came under observation in the early hours after the perforation,— before absorption had time to take place. These, however, only accentuate the dangers of delay until the syndrome of collapse appears, often regarded a *sine qua non* to diagnosis.

Again the symptoms of perforative peritonitis often occurred as a continuation of or an addition to the symptoms of appendicitis, as most of the cases have resulted from primary or secondary perforations of the appendix. We accentuate in this paper the mild symptomatic cases to encourage early diagnosis; the great majority of our cases, however, presented the painful and distended abdomen, the sunken features, the anxious expression, the flexed thighs, the thoracic respiration, etc., etc., so typical of peritonitis.

CLINICAL RESULTS

There is no disease in the entire field of medicine in which the many lines of treatment in the past have been so grossly at variance as in "general peritonitis" so-called. From the physician who despaired after making a diagnosis and exclaimed, "The case is hopeless, why operate and bring surgery into disrepute?" there are many steps to the other extreme. One opened and drained simply, another opened the abdomen and "flushed every nook and cranny," still another eviscerated the patient and sponged off every drop of pus and flake of lymph. Patients have actually been operated upon *and then placed in bath-tubs filled with mild antiseptics* in the attempt to cleanse the cavity by constant washing. One urged opiates, another catharsis, one gave fluid by mouth, another by hypodermoclysis, and a third none at all; one elevated the foot of the bed "to promote absorption," another sat his patient up to retard it. Whom, I ask, shall the profession follow and why? This divergence was attributable to imperfect diagnosis,

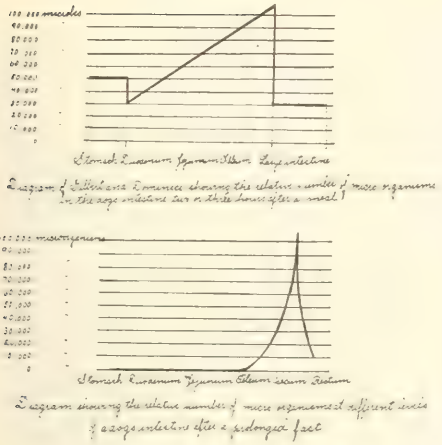


Fig. 1.

inadequate knowledge of the physiology and pathology of the peritoneum, and finally, the hopelessness of all types of treatment in the free spreading varieties.

To-day one can scarcely pick up a journal without finding one or more articles on the subject, many presenting mortality statistics. It is not within the scope of this paper to tabulate results from the literature; however, we will present a few statistics, individual and hospital, gathered at random, not so much to make comparisons or draw conclusions therefrom, as to emphasize the *gravity of the disease and the appalling mortality it has had in the past.*

That diffuse suppurative peritonitis has been an extremely fatal disease is definitely shown by the older statistics. There is probably no disease, not excepting diphtheria, since antitoxin has been discovered, in which changes in treatment have reduced the mortality percentage so noticeably as the modern treatment of general septic peritonitis. The statistics of Mikulicz are given in three periods:

CLINICAL RESULTS IN THE PAST

	Cases	Deaths	
1885–1893	35	34	97%
1894–1896	68	36	53%
1896 to time of writing	cases of less than 12 hours,		17%
	cases over 12 hours,		43%

The prognosis depends upon many factors. The character of the micro-organism, if there be but one, has some bearing. The gonococcus and the pneumococcus are in uncomplicated cases certainly the least dangerous. The staphylococcus pyogenes aureus is a comparatively mild variety, yet not to be despised. The colon bacillus, which is present in a large majority of the cases, produces a violent and dangerous peritoneal reaction. B. pyocyaneus and streptococcus are comparatively rare varieties, but when present are extremely fatal, because of their highly toxic products and the failure of fibrin formation; the danger is especially great in the streptococcus on account of its tendency to produce a subperitoneal cellulitis. We are not giving the detailed bacteriologic reports of our cases, as in many of them the cultures were made from the fluid and not from the surface, rendering them of little value from a statistical standpoint.

The location of the perforation is a very significant element, since it determines the virulence of the infection, which varies in different portions of the intestine (see chart). In the region of the appendix bacterial activity *is at its height,* and when a large number of cases are estimated they will be found fairly equal in virulence. We are convinced that one cannot justly say *this* appendiceal perforation was fatal because the infection was so highly malignant and *that* recovered because the infection was mild. Variations in virulence occur, but the essentials are the patient's resistance, the quantity of irritant chemical and mechanical material which has escaped, the time which has elapsed before reaching the operating-table, whether or not he has had opiates, the degree and duration of the surgical trauma, and the post-operative treatment. The same remarks are equally applicable to perforations of the stomach, duodenum, and other parts of the intestines. The location of the free spreading peritonitis has a distinct bearing on the prognosis; pelvic infections are mild; those in the diaphragmatic zone are dangerous; between these anatomic positions various gradations exist. There is no doubt that in perforations in which small quantities of material slowly escape, the bacteria can be absorbed, the infection encapsulated, and the patient recover with-

out operation, as we have repeatedly observed in gastric ulcers, none of which is included in our series. In cases in which large quantities rapidly escape, operative results may be successful in one case and fail in another. *The rapidity with which escape takes place is a determining factor in the ultimate destiny of the case.*

The causes of death are: 1. Acute septic absorption (biotic and toxic), the earliest and most common cause; therefore treatment is primarily instituted to prevent absorption. 2. Intestinal paresis (adynamic ileus), often a dangerous complication, as it prevents drainage and favors absorption. 3. Continuance of the peritonitis, which is in reality only a factor of 1 above. 4. Mechanical intestinal obstruction (mechanic ileus). 5. Pneumonia, septic, due to embolic processes, or aspiration pneumonia of anæsthesia. 6. Pyæmia, septicæmia, or pylephlebitis. 7. Exhaustion due to secondary abscesses. 8. Persistence of the primary cause, gastric ulcer, continuation of the typhoid, etc. (We do not include in this paper post-abortive or post-parturient peritonitis, as these involve subperitoneal cellular as well as intraphlebitic infections).

Let us note how the various operators have endeavored to overcome these mortality causes and with what success.

Edwin Welles Dwight, in the Boston City Hospital (1902), reports 35 cases of diffuse peritonitis, and in a general way gives a line of treatment; the point he emphasizes is that he flushes until the fluid returns from all parts *clear*, if necessary he uses 40 to 50 quarts of water injected through a large flushing tube. His classified statistics are as follows:

	Cases	Deaths	Mortality
Appendicitis	18	9*	50%
Salpingitis	10	9	50%
Abortions	2	2	100%
Miscellaneous	5	4	80%
Total	35	20	57%

(*One of these died on the 20th day.)

A. R. Thompson, in Guy's Hospital Reports (1897), records 52 cases of perforated gastric ulcer with peritonitis; 40 died, a mortality of 77 per cent of the operated cases. The peritonitis here was from the least virulent of the digestive tract zones. He details the technique of irrigation and sponging.

Recently, Joseph A. Blake read an exhaustive paper on this subject before the Chicago Medical Society in which he reports 99 cases of peritonitis of various etiology and elaborated on the treatment. Of these there were of

	Cases	Deaths	Mortality
Appendicitis	78	15	19.2%

Of those that died, 7 were only superficially drained, 7 to the stump of the appendix and 1 to the pelvis. Of the 7 superficially drained, 2 recovered from the peritonitis, but 1 died of pneumonia on the fifth day, and the other of an "undetermined" cause on the sixth. Of the 8 deeply drained, 4 were moribund when admitted and died in a few hours; the other 4 died of sepsis and continued peritonitis.

Of 13 cases of perforated ulcers, 3, in which the perforation was over 36 hours old, died; another on the 26th day of an intestinal obstruction due to adhesions, a mortality of 23 per cent from the peritonitis. (It is to be added that these had intestinal or stomach contents in the abdomen.) Of 8 typhoid cases, 4 died, a mortality of 50 per cent.

In general, his treatment is: 1. Remove or close as rapidly as possible through a small incision the atrium of infection. 2. Wash, or extensively irrigate the peritoneal cavity. 3. Use as little drainage as possible, and do not attempt general peritoneal drainage.

He believes the only drawback to irrigation, which he uses uniformly, is that it prolongs the operation; he does not believe that it entails further important trauma, nor that it spreads the pus to uninfected zones of the peritoneal cavity. As an *absolute indication* for irrigation, he mentions the presence of gastric or intestinal contents. He states that "washing accomplishes at once what is more slowly and imperfectly performed by drainage." His after-treatment is largely on our original lines, except that he prefers a more intermittent proctoclysis. In comparing recent results with past experience, he cautions against laying too much stress upon any one detail of technique. He says:

1. We now operate more rapidly.
2. We aim to get the patient to bed quickly.
3. We use large quantities of fluid.
4. The gastrointestinal tract is rested.
5. The Fowler position is maintained.

All of these have marked advantages over the older methods, each contributing its share to the general good results.

Franz Torek reports 18 cases (to which he subsequently added 3) with 3 deaths, mortality 14 per cent. He says: "The pus is allowed to flow out . . . . (or) it is dipped out with gauze sponges or swabs." "After having removed the appendix, I flush the peritoneal cavity with large quantities of saline solution *poured from bottles or pitchers*. The flushing is done in sections, a portion of the peritoneal cavity being cleaned at a time." He actually washes the intestine "by some gentle to-and-fro motions of the hand." "Whenever fresh adhesions between adjacent coats of intestines are encountered, they must be loosened. When the lavage has been finished, I close the abdomen completely without drainage."

He had no deaths in cases operated before 70 hours after the onset of the peritonitis. The first fatal case was that of a boy of 10 years, who was moribund when brought in four days after the onset of the disease; he died two hours after operation; the second had gone on quite nicely until the sixth day, when for some unaccountable reason the temperature rose and the patient died with symptoms of sepsis; the third was operated on the fourth day of an appendicitis with a very septic course; operation did not tend to diminish the symptoms.

He attributes an especial virtue to the washing of the peritoneum by pouring the fluid into the cavity.

These results are certainly remarkable, in view of the fact that he did not drain his cases with such good results otherwise, one cannot help but speculate on the possibility of having saved at least two of his three fatal cases had he drained them.

What *special reason* there is for considering the omission of drainage in a suppurative sac of peritoneum advantageous when we institute it in all other types of *acute* pus cavities, we cannot understand.

L. W. Hotchkiss reports three series of cases. The first consists of 12 cases from 1895 to 1899 which were treated by "free opening, more or less evisceration, saline irrigation, and drainage." Eleven died.

The second details 15 cases with no deaths. These were treated by "rapid removal of the appendix . . . . omitting the broad protective packings of gauze to prevent soiling, free irrigation of the pelvis and lower abdomen with hot normal saline solution, and closure of wound down to a small cigarette drain which led to the pelvis and appendiceal site."

The third series during the period from 1902 to 1906 consisted of 28 cases in which the pelvis and lower abdomen were washed out with a Blake tube or the jacketed glass return-flow canula. The peritoneal cavity was not drained. Five of these died, 3 were moribund when operated, 1 probably had pneumonia at the time of the operation, and another had an extensive tuberculosis of the lung. Omitting his first series, he had 43 cases with 5 deaths, a mortality of 11½ per cent. He believes that his success is due in part to non-drainage of the peritoneal cavity.

The mortality in 161 cases of general suppurative peritonitis of appendiceal origin, in the Massachusetts General Hospital for a period of 5 years, was 66 per cent; the number of deaths decreased from 72 per cent in 1899 to 52 per cent in 1900. In St. Thomas Hospital, of 100 cases flushed, 80 per cent died; of 19 cases not flushed or sponged, 47 per cent died, and these were mostly late cases. Harte and Ashhurst collected a large number of cases of typhoid peritonitis from the literature; a tabulation of 200 odd cases in this collection with reference to the method of treatment is interesting.

	Cases	Rec.	Died	Mortality
Drainage, no wiping or irrigation	17	10	7	41%
Wiping and drainage	31	12	19	61%
Irrigation and drainage	176	46	130	74%
Wiping, irrigation, and drainage	11	1	10	90%

While the number of cases under the above headings varies considerably, each is large enough to eliminate mere chance. It is remarkable to note how each additional procedure in the operation adds from 15 to 20 per cent to the mortality. The procedure itself adds its quota of deaths, while the more extensive handling necessary to carry out the procedure adds an additional percentage, and finally the prolongation of the operation and

the greater quantity of anæsthetic swell the total to its appalling proportions.

George Woolsey reports 17 cases of typhoid perforation operated by different surgeons, including 6 of his own; 14 of these were irrigated, in 2 it is not specified, 1 was not irrigated, but the area of perforation was cleansed; 4 of these recovered, a mortality of 76.4 per cent; of his own 2 recovered, a mortality of 66⅔ per cent.

He emphasizes the fact that children do well in typhoid perforation and that cases operated late often recover, probably because the type of infection is mild.

Stuart McGuire says "a record of 24 patients with diffuse suppurative peritonitis. The first 6 were treated by the old method of irrigation and multiple drainage, with 5 deaths, 87.5 per cent. The last 18 [now 22, from recent communication] were treated by the Murphy method with but 1 death."

TREATMENT

The details of the treatment of perforative peritonitis will be considered in the order in which the pathologic processes appear, that cause the mortality.

First, septic intoxication is the primary and most frequent cause of death in perforative peritonitis. The prevention of absorption is therefore of greatest importance. There is a pre-operative period in which much may be done to retard absorption, preparatory to surgical intervention.

The pre- and post-operative importance of the Fowler position is underestimated. The patient should be placed in the Fowler position at his home the moment the diagnosis is made, and kept so until convalescence is well advanced. He should be taken to the hospital in this position to prevent the spreading of the infection to the upper abdomen during transportation, carried so to the operating-room, and operated upon with at least the shoulders well elevated, if, as may be the case, the abdomen cannot be approached in the sitting position. This procedure is based on the physiology of peritoneal absorption, normal and pathological, and further discussion is not necessary.

It is scarcely necessary to dwell on the importance of peristaltic rest by withholding food (emphasized by Ochsner), or the application of cold to the abdomen, for lessening the distribution of the infective material. The use of opiates for this purpose is to be condemned, as the relief from pain experienced by the patient, the apparent improvement in the general condition, and the mild cardiac stimulation produced, give a *false sense of security leading to dangerous delays.*

Gastric lavage may be resorted to with advantage, immediately preceding the operation, if the case is twenty-four hours advanced, —the operation to be performed at the earliest possible moment. In intensely poisoned and cyanotic cases, a pre-operative intravenous injection of two to four pints of normal salt solution materially improves the condition.

Anæsthetic. We use ether anæsthesia with the drop method, given by the sister in charge of anæsthetics who has had an experience of over 8,000 anæsthesias. In no case did it require over seven minutes to produce complete relaxation. We feel that the anæsthetic should never be started in these cases until the patient is on the operating-table and all prepared for the incision; then it should be rapidly pushed to completion, but never by asphyxiation with an ether cone.

Nitrous-oxide gas answers admirably for these operations, and in expert hands gives most gratifying results.

Stovaine spinal analgesias give complete relief from pain in a short period of time and stimulate peristalsis as observed by Brewer, Moynihan, and others.

Local analgesias, Schleich, and others have been used, but they do not permit of easy intra-abdominal work and we believe are poor substitutes for nitrous-oxide gas or ether.

The line of incision. This is to be made over the seat of perforation when its location has been determined; otherwise it is made at the right of the median line, as the perforations are much more common in the right than in the left half of the abdomen and the incision can be enlarged upward or downward *ad libitum* without dividing muscle-fibres transversely. The manner of going through the abdominal wall is of little moment and depends upon the individual operator's custom. For appendiceal

cases we make the incision at the outer edge of or through the right rectus muscle, open the peritoneum quickly, and locate the point of leakage. If the duodenum or stomach be perforated, enlarge the opening immediately, as it is necessary for free work and avoids traction on the viscera in these cases. If the appendix is suspected it can best be brought into the field by passing the finger of the right hand outward beneath the abdominal wall to the base of the fossa, then turning inward and upward over the iliac vessels, hooking up the meso-ileum and bringing it into the field. The ileum can then be readily followed to the appendix, which saves much time and manipulation.

Closure of the leak. If this be the appendix, for the sake of speed clamp it at its base, ligate it in the crease made by the clamp, and amputate; *burial of the stump usually entails too much time and manipulation to warrant its execution.* Return the cæcum to the abdomen. If the leak be an intestinal or gastric ulcer, close by a double or triple row of Lembert sutures. In gastric cases, with considerable inflammatory induration about the ulcer, this may be difficult or impossible; in such cases close the opening by stitching a coil of the duodenum or colon over it. (Case of Mr. C. cited below.) *Never permit the opening of a perforation to remain patent,* depending upon drainage for relief. In 18 cases of perforating duodenal ulcer, reported by Laspèyres, in which drainage alone was used without closure of the abdomen, 17 died immediately and 1 four months later from peritonitis; while of 15 cases in which the opening was closed and the abdomen drained, 5 recovered. (See article on "Perforating Ulcers of the Duodenum," Am. Journal of Obstet., vol. xlvi, No. 6, 1902.) Do not resect gastric ulcers in the presence of perforation. If the pylorus is involved in the induration and obstruction is likely to follow, perform a posterior gastrojejunostomy with the button; in these cases, sew the duodenum securely over the perforation, peritoneal side in, as in case following:

Mr. C., aged 72 years, referred to me by Drs. Mix and Lespinasse. Patient had complained of gastric disturbances for ten or fifteen years. Most of that time he was restricted to a milk diet. At eight o'clock on the morning of his admission to the hospital, he was seized with a severe pain in the abdomen, great dyspnœa, and nausea. The distress in breathing was so great that it resembled that in angina pectoris. A diagnosis of perforative gastric ulcer was made, he was removed to the hospital, and at 5 P. M. he was operated. An opening large enough to admit the tip of the little finger was found in the center of an induration 2½ inches in diameter in the anterior wall of the stomach, the margin involving the pylorus; this induration was such as to prevent suture of the edges; the duodenum was freed by dividing the peritoneum on its outer side, it was flapped or rolled over and fixed with two rows of sutures, making a patch over the perforation. A posterior gastro-duodenostomy with the oblong button was then performed. The entire operation occupied about one-half hour. A drain was inserted down to the gastric patch; the right rectus was split at its pubic attachment and a tube inserted into the recto-vesical pouch. Large quantities of gastric fluid immediately escaped through this tube and continued to escape for three days. Considerable fluid also escaped from the upper gastric drain. He was placed in the Fowler position and was given one 20-c.c. dose of streptolytic serum, hypodermically, every 24 hours. Proctoclysis was instituted. His recovery was uneventful and the button passed in the usual time.

The mortality from simple drainage without closure of duodenal, gastric, and intestinal perforations is such as to brand that line of treatment as inefficient and unjustifiable.

Washing removes the pus, with its myriads of leukocytes, sent there for the sole purpose of protection; if it be soon after the peritonitis has set in the pus may contain only the harmless staphylococcus albus. If it be late, washing will endanger the patient, in that it tends to carry virulent colon bacilli to new, unaffected parts of the peritoneum.

Irrigation of the whole cavity prolongs the operation, necessitates more or less evisceration, traumatizes the peritoneum, spreads the infection everywhere, and especially does it carry it to the diaphragmatic zone.

Dudgeon and Sargent believe that streptococcus peritonitis is a clear indication for flushing and "the most thorough possible." This is advocated because the spreading of such a peritonitis is extremely rapid, and the phagocytes are but little able to cope with this form of infection and may be washed away without robbing the patients of what, in other infections, constitutes the chief defense; our views on this matter have already been given. Streptococci travel through the peritoneal

and subperitoneal lymph spaces freely and cannot be washed out.

In virulent infections, gastric perforations because of foreign bodies, and intraperitoneal hæmorrhage, many writers advise thorough washing with a view of removing the foreign material, gastric or intestinal contents, and blood. This might have advantages if it could be effectually accomplished.

The author cites the following case as an illustration of the streptococcus infection. Young female admitted to medical department of Mercy Hospital Sunday evening; had complained of intense pain in abdomen since Saturday morning; leukocyte count 22,000. Monday morning at nine o'clock it was 34,000; at twelve, when she was transferred to the surgical department, it was 80,000; all of these estimates were made by the same microscopist. The abdomen was greatly distended, and a diagnosis of perforative peritonitis was made. On opening the peritoneum it was found intensely congested and œdematous, and contained a moderate quantity of free pus. The appendix was found to be the atrium of infection; it was free from adhesions and was removed as above described; a large drain was inserted down to the pelvis; patient was placed in the Fowler position and 20 c.c. of streptolytic serum were administered at a single dose and repeated every 24 hours for four days; a continuous proctoclysis was instituted, and 24 to 30 pints of salt solution were absorbed each 24 hours. It was a pure streptococcus infection and we believe came to the appendix from a streptococcus infection which the patient had had in her index finger two weeks before. Recovery was uneventful. *The relief of pus tension is the first surgical step toward retarding absorption in all acute injections.* The maintenance of low pressure in every pus pocket is a *sine qua non* to continued freedom from absorption. Reduction of tension *must be initial* and the *absence of pressure continuous.* These purposes are accomplished by drainage.

Drainage. Fenestrated or split rubber tubes inserted to the stump of the appendix or the site of the ulcer, and into the vesico-rectal or Douglas' pouch, and any other pus pockets that may exist, is the only form of drainage permissible. Glass tubes cause strangulation, pressure necrosis and kinks that have been a frequent cause of death. Gauze packings, drains, loose or cigarette, cease to be drains in a very few hours and are then a distinct menace. They are to be used only to wall off intestinal contents where necrosis has occurred or is imminent, *and then only in conjunction with tubes.*

As already stated, some operators attribute an especial element of success to their *non-drainage.*

In every position in the body where a virulent pus cavity has been opened and there has resulted a lowered temperature or a disappearance of fever, the toxic manifestations again arise when the pus becomes retained under pressure.

These principles are axiomatic in the management of acute infections in other parts of the body, and the peritoneum should be no exception. True, the peritoneum has great resistance against bacterial invasion and can care for a larger quantity of mildly virulent infective products without drainage, but if the tension on these products is restored and they are virulent, death after operation will occur on the same basis as preceding it. Therefore, the continuation of the drainage is vital in the virulent cases and will save many lives. The peritoneum should continue to be treated in these particulars, on the same basis as infections in other portions of the body. We do not wash, scrub, knead, or traumatize acute osseous or cellular phlegmonous cavities. Why the peritoneum? The advice of Callender over a half century ago, "do not milk an abscess," was admirable, and is applicable to the peritoneum.

The abdomen is often closed with pints of pus still in the peritoneal cavity; its low pus tension is maintained by the tube which is stitched to the lower angle of the wound or brought out through the rectus muscle.

The entire technique should be accomplished in a very few minutes, i. e., get in quickly,—get out quicker. Time is vital in these cases. If the anæsthesia is prolonged, the manipulation great, the sponging and flushing excessive, the patient leaves the table with a feeble capillary circulation and does not rally. It has

taken 15 years for the surgical profession to overcome the evil tendency of slow and prolonged operations advised and practiced by the masters of surgical pathology 20 years ago. The records of every hospital in the period from 1889 to 1904 prove the truth of this statement; they read: peritonitis — operation — death from collapse.

The pus discharges from the tube for many days in some cases and only for a short period in others. The tube does not become rapidly circumscribed by agglutinations if the pus is virulent, notwithstanding some of the recent teachings, based on animal experiments.

PROCTOCLYSIS — ENTEROCLYSIS

As soon as the patient is returned to bed, proctoclysis is instituted and maintained until the serious symptoms of intoxication cease. The continuous method is by far the most scientific and successful. *Moderate distension* is the normal condition of the large intestine. If it is *hyperdistended* it causes spasm and expulsion of material. The mucosa of the large intestine absorbs water with great rapidity. We have administered 30 pints of normal salt solution in 24 hours to a patient 11 years old, and it was all retained. *The retention of fluid in the colon depends entirely upon the method of its administration.* We have visited hospitals numbers of times and have been shown patients who were receiving the "Murphy treatment." We should not have recognized it without the label. It is difficult to impress doctors and nurses with the importance of details, notwithstanding that the best results are secured only by close attention to detail. The fluid should be administered through a fountain syringe to which is attached a $\frac{3}{8}$-inch rubber hose fitted with a hard rubber or glass vaginal douche tip with multiple openings. This tube should be flexed almost to right angles 3 inches from its tip. A straight tube must not be used, as the tip produces pressure on the posterior wall of the rectum when the patient is in the Fowler position. The tube is inserted into the rectum to the flexion angle and secured in place by adhesive strips binding it to the side of the thigh so that it cannot come out; the rubber tubing is passed under the bedding to the head or foot of the bed, to which the fountain is attached. It should be suspended from 6 to 14 inches above the level of the buttocks and raised or lowered to just overbalance hydrostatically the intra-abdominal pressure, i. e., it must be just high enough to require from 40 to 60 minutes for $1\frac{1}{2}$ pints to flow in, the usual quantity given every two hours. *The flow must be controlled by gravity alone and never by a forceps or constriction on the tube*, so that when the patient endeavors to void flatus or strain, the fluid can rapidly flow back into the can, otherwise it will be discharged in the bed. *It is this ease of flow to and from the bowel that insures against over-distension and expulsion onto the linen.* The fountain had better be a glass or graded can, so that the flow can be estimated. The temperature of the water in the fountain can be maintained at 100° by encasement in hot-water bags. The fountain is refilled every two hours with $1\frac{1}{2}$ to 2 pints of solution. The tube should not be removed from the rectum for two or three days. When the nurse complains that the solution is not being retained *it is certain it is not being properly given;* even children tolerate proctoclysis surprisingly well. We believe that, next to the conservative technique of the operative procedure, proctoclysis is second in importance as a life-saver. It rapidly restores blood pressure, it improves the capillary circulation, it quiets the thirst, it eliminates the septic products and increases the excretions. All of the details are simple, but they *must be carried out with precision to secure the best results.* If the patient has a tendency to vomit, is nauseated, or shows evidence of gastrectasis, lavage should be practiced and repeated often if the stomach refills with fluid.

Serum treatment. Anti-streptococcic serum is beneficial in those cases where local resistance is meagre and the leukocytic reaction feeble. It is decidedly indicated in the streptococcic cases. Colon bacillus vaccines controlled by opsonic index, after the practice of D. J. Davis, of Chicago, are capable of raising the index to four or five times the normal. This work, however, is yet in its infancy, and until we can get a means more simple than the opsonic index to avoid inducing the negative phase these vaccines will be little used.

As before described, the protective peritoneal injections of nuclein, oils, etc., open another field for extensive experimental and clinical observation.

We have used the streptolytic serum in a large percentage of our cases, and we believe with beneficial effect; 20 c.c. are injected immediately after the operation and the same quantity each succeeding twenty-four hours until the patient is out of danger.

Dressings. The dressings should be changed as often as is necessary for the comfort of the patient. Once every 24 hours the tubes should be rotated a trifle, first to the left and then to the right, to prevent closure of the fenestræ by adherence of omentum or intestine. Suction, irrigation, and pyrozone injections are unnecessary and dangerous, as the plus abdominal pressure forces the pus out.

DRUG TREATMENT

Opium and its derivatives and coal-tar anodynes were never given either before or after operation. While opium might be a valuable aid in retarding peristalsis, it also adds to the intestinal retention, thus circumscribing the process in the early stage. The toxic absorption, which is sufficiently great as it is, has then added to it the retention of poisons in the intestines, where absorption continues; finally a dose of morphine is super-added, which may be just sufficient to turn the tide against the patient.

Dudgeon and Ross (quoted by Dudgeon and Sargent) have shown that leukocytosis is markedly inhibited by morphine.

Adrenalin, strychnine, camphor, or caffeine are the most valuable stimulants in the order named, but are rarely given. The intravenous infusion of 800 to 1,000 c.c. of salt solution, with six drops of adrenalin, is strongly recommended by Heidenhain for restoring the blood pressure and overcoming collapse.

Calomel in $\frac{1}{8}$-grain doses may be given at short intervals (every 10 to 15 minutes) until two grains are administered.

Ileus is a frequent, very annoying, and often dangerous complication. The *adynamic type* (due to the paresis of the intestine as a result of the peritonitis) with its coprostasis and tympany is rarely associated with nausea and vomiting. Tympany is marked and "gas pains" recur frequently; continued post-operative tympany is always indicative of danger. Inability to expel flatus or fæces often continues for days after operation. The symptoms become most urgent at the end of the second and the beginning of the third day; if still continuous, they become alarming and the condition is dangerous. Statistics show that ileus is an extremely common cause of death. If nausea and vomiting are present, gastric lavage must be practiced, bearing in mind that repeated emesis of small quantities indicates an over-distended stomach, analogous to the incontinence in over-distension of the urinary bladder. The treatment of this condition consists of repeated carminative or saline enemata. High enemata of alum water ($\frac{1}{2}$-oz. dried alum to the quart of water) have been found effectual in our work; they stimulate peristalsis in the large intestine and often give relief, and should always be given with a fountain syringe, never with a bulb. Medicinally the best results are obtained by hypodermic injections of physostigmine (eserine) salicylate repeated every two hours in doses of 1–60th to 1–40th grain. We consider the hypodermic injection of atropine sulphate, 1–60th grain, repeated every three hours until constitutional effects appear, next in efficiency. If these methods fail, the case is indeed desperate, and the possibility of a mechanic ileus must be considered.

The symptoms of mechanic ileus are essentially the same as under other circumstances, but in practice it is difficult to say when a condition ceases to be adynamic and becomes mechanic in character. Pain, wave-like and colicky, increasing frequency of emesis until it becomes a gulp every two or three minutes is the clinical picture. The vomitus is never fecal but often of offensive odor. The meteorismus increases with time, the degree of distension depending somewhat upon the length of intestine above the seat of obstruction, all of which is distended with gas and fluid. In the early stages of the obstruction stormy peristalsis is manifest but becomes less and less as the intestine becomes fatigued. Borborygmus is one of the most positive signs of mechanic obstruction; it is never present as a result of

continued peritonitis or paralytic ileus. Coprostasis is persistent; at first there may be small quantities of fæces passed after enemata; this is merely the material in the lower bowel and might mislead, especially if an inexperienced nurse reports "a bowel movement." Gastric lavage may stop the vomiting and give a fallacious sense of security. There is no more perplexing problem in all surgery than to decide when to reopen the abdomen with symptoms of post-operative ileus; the more experience one has the more one appreciates the inadequacy of diagnostic guides. If the treatment for adynamic ileus described above fails to produce results within a limited time, it should be assumed the obstruction is mechanic and the abdomen reopened, meeting indications on a basis of general principles. Such cases should never be permitted to go to the stage of capillary cyanosis, a definite sign of intense intoxication and approaching dissolution. In our series of 49 cases (the last one operated by the author's associate, Dr. Neff, during his attendance at the meeting), we have had 6 of post-operative ileus; 3 were relieved by removing the stitches and incising a distended intestinal coil at the side of the drainage tube after staying it with two or three through-and-through silk sutures. This relieved the tension; fæces escaped for a few weeks, and the opening healed in each case without intervention. In continued excessive tympany, with anxious expression, rapid breathing, and little capillary stasis, the wound should be reopened and an enterostomy performed as above, even when the ileus is adynamic. It favors drainage and lessens absorption. A fourth case was operated out of the city; the patient had an obstruction five weeks after the operation and died of collapse six or eight hours after an operation for the obstruction; this is not included as a death from suppurative peritonitis as the patient was not under our immediate observation and the death was so long after and independent of the peritonitis.

Case No. 46. (5th case of ileus.) A very fleshy man with peritonitis from direct perforation of appendix into free peritoneum, operated 27 hours after perforation and 58 hours after the onset of the appendicitis; diffuse and spreading peritonitis; offensive pus throughout; appendix removed in the usual way; deep pelvic drain; the patient had an old right inguinal hernia which was not disturbed. Left the operating-table in good condition. The abdomen became gradually more and more distended; the evening of the second day there was some emesis, relieved by lavage. Peristalsis was active, but there was no bowel evacuation; on the morning of the third day the emesis was more frequent, pulse 120, capillary circulation good, no bowel movement of importance, although interne and nurse reported passing of flatus. Patient was taken to the operating-room and we could not conclude that it was a mechanic ileus so he was returned to his room. At 9 o'clock the night of the third day, 82 hours after the operation, his capillary circulation began to change, and the emesis became more frequent. The pulse had quickened to 138. The abdomen was opened in the middle line. A gangrenous coil of intestine 14 inches in length was found, which ruptured on lifting it out of the cavity; the gangrene was due to the twisting of the coil around the omentum, which had become adherent to the old hernial opening, using the omentum as a turning pole, thus compressing the omentum and stopping the circulation, causing gangrene, while the lumen of the bowel was free and permitted the escape of gas as reported by the interne and nurse. The peritoneum was entirely free from pus. The gangrenous coil was freely opened and retained in the wound with rubber tubes in the proximal and distal ends. The capillary circulation was extremely poor at the completion of the short operation and the patient died seven hours later. This death was due to our inability to differentiate between adynamic and mechanic ileus, notwithstanding that the patient was under our direct observation.

Case No. 37. I. I. was admitted to the Presbyterian Hospital Sunday, November 24, 1906. On Sunday, November 17th, the patient complained of headache and severe pain in the abdomen, shortly followed by vomiting. His abdomen became sore; he had some fever but a doctor was not called. He remained in bed two days, Monday and Tuesday. Friday he did not feel so well, and Saturday, the 23d, he was attacked with severe pain in the region of the umbilicus. A few hours later he vomited, his pain became intense, and continued throughout the day. He had eaten nothing since Friday afternoon as he felt indisposed toward evening. He had a high fever Saturday evening and Sunday forenoon. He was prepared for operation at nine o'clock Sunday evening, November 24th, seven days after the onset of his trouble and thirty-three hours after the occurrence of his perforation. The abdomen was opened and a large quantity of offensive pus escaped immediately on incising the peritoneum. The appendix was found near the brim of the pelvis, its end was free from adhesions, and an opening existed communicating directly with its lumen. The area of gangrene was not more than one-half inch in length. The offensive pus was throughout the exposed field and pelvis, and a large quantity welled up from the pelvis, The appendix was excised in the usual way. A large drainage tube was inserted into the vesico-rectal pouch and brought out through the wound. The patient's abdomen was very much distended and considerable

tension was exerted on the sutures. Microscopic examination showed pneumococci and staphylococci; no streptococci. Proctoclysis was continued for four days. Adynamic ileus was a marked feature in this case, but a secondary opening was not resorted to.

May 1, 1908, seventeen months after the peritonitis, the patient presented himself at clinic, at 12 o'clock, complaining of pain in the abdomen, nausea and vomiting which had been present since 3 o'clock the previous afternoon. Dr. Neff was conducting the author's clinic. He made a diagnosis of intestinal obstruction, immediately opened the abdomen, and found the ileum rotated two-thirds of a circle on itself, looped for 10 inches and bound down by adhesions. The patient made an uninterrupted recovery. This is the sixth case of ileus in the 49 cases operated.

Pulmonary complications, even bronchitis, were very rare. We had one case of double pneumonia, No. 16 of our series.

Girl, aged 5 years, operated on third day of appendicitis, 24 hours after the onset of a general suppurative peritonitis. On the fourth day the abdomen was scaphoid; the bowels were moving regularly and the patient was considered quite out of danger. That evening she developed pain in the right side, with a few râles, next morning there was considerable consolidation of the lower lobe, with beginning pain in the left side; by evening the left lower lobe was rapidly consolidating. The morning of the sixth day respirations were 80, pulse was 160 to 170, severe dyspnœa and cyanosis, abdomen flat, bowels moving, no emesis. She died on the evening of the sixth day, from a double pneumonia.

We have included in this paper only such cases of spreading, free peritonitis as resulted (a) from direct communications of the alimentary canal into the free peritoneal cavity, (b) perforations of the appendix with primary retention of the infective material in a circumscribed zone and subsequent rupture into the free peritoneal cavity, so that there resulted a communication from the intestine, through the appendix, and through the abscess into the free cavity. We do not include any cases of peritonitis with circumscribed abscess not communicating with the free peritoneal cavity, no matter how much pus was present in the general cavity. If we did, the number would run into the hundreds. Many times with circumscribed periappendiceal abscesses and circumscribed perigastric abscesses there are large quantities of pus in the free cavity, usually of the staphylococcus type. This is not considered a general suppurative peritonitis nor a perforative peritonitis; it is a circumscribed abscess with defensive pus in the free cavity, and is a less dangerous condition than if no pus was present in the cavity around the circumscribed abscess.

The cases included in this series cover a period of a little over five years, since the institution of our present plan of treatment, and practically all of them have been managed in identically the same way. They have all been operated in public institutions, in my ward and private service, the records of which are open for inspection. Four of the cases were operated in my service by Dr. J. M. Neff and one by Dr. Charles J. Rowan, my associates.

There were 50 cases* in all operated: 2 were gastric perforations, 1 duodenal, 4 typhoid, and 42 appendiceal. The 16th and the 46th cases died: the first from a double pneumonia on the sixth day after the operation (cited above); the second from a mechanic ileus and strangulation of the intestine around the omentum which was adherent to an old hernial opening (also cited above).

The severity of these cases may be estimated

* Since completing the above article we operated upon case 50. Boy, J. P., age 7 years, referred by Mr. Russell admitted to Mercy Hospital May 18th. The appendix was free from adhesions and had a clean-cut perforation near its base, which admitted the gangrenous contents of the appendix into the free peritoneal cavity and set up the peritonitis. The usual treatment was instituted. Pus continued to discharge freely for five days. On the evening of the 4th day he showed evidence of a beginning "right side" pneumonia. On the morning of the 5th day the consolidation was complete. On the evening of the 6th day his temperature was 100.6°, his pulse 120. His abdomen, which had been enormously distended, was now flaccid and relaxed and his bowels moving freely. His general condition is excellent.

Case 51. H. C., male, aged 23 years, referred by Dr. Edwards, admitted to Mercy Hospital May 15th. He had been ill for 8 or 10 days with typhoid fever. The day following admission he had a very profuse intestinal hæmorrhage. At 7 o'clock, May 24th, he was attacked with acute pain in the right iliac fossa. His abdominal wall became rigid and very sensitive to pressure. At 7:30 his temperature was 105°, pulse 130; leukocyte count 4,600. There was no vomiting. The pain spread rapidly over the abdomen. At 11 a. m. May 25th, he was seen by Dr. Edwards and transferred to the surgical side with a diagnosis of typhoid perforation. His pulse was 138, and leukocyte count 9,000 just preceding operation. On opening the abdomen there was escape of gas and intestinal contents. The appendix showed an infiltration resulting from the typhoid ulcer but had not perforated. The ileum was drawn into the field and a number of ulcers recognized through the wall. The perforation was found 16 inches from the ileo-cecal valve; the intestinal contents were pouring out of the opening. The perforation was closed with three rows of Lembert Pagenstecher linen sutures. A ½-inch drain was inserted into the recto-vesical pouch and brought out through the wound. A pint or more of intestinal fluid flowed from the pelvis through the tube. There was a general peritonitis. Time for complete operation 18 minutes. There was no irrigation nor sponging. The patient was placed in bed at an angle of 55° and proctoclysis instituted. Two hours after the operation the leukocyte count was 9,000. Six hours after operation it was 9,400. His temperature had dropped to 101°. His pulse was 112, while immediately following the operation it was 140. The anesthesia was ether. No emesis took place. He was given 20 c. c. of streptolytic serum.

With these cases added, we have a total of 51, with 5 typhoids 100 per cent recovered and less than 2 per cent mortality in all cases.

Seventy-four hours after operation of last case, pulse 96, temperature 100.6° F. No emesis. Abdomen flat, bowels condition excellent.

J. B. M.

from the fact that 7 had to be re-operated for circumscribed accumulations of pus in various parts of the abdomen; 6 had to be re-operated for mechanic ileus,— making 26½ per cent of cases requiring a second operation.

In each of the circumscribed abscess cases, there was a return of the temperature, local tenderness, and local and circumscribed resistance, but in none was there a development of a second general peritonitis. The occurrence of secondary abscesses indicates that even the Fowler position and pelvic drainage were not ample to avoid circumscribed accumulations of pus; these, however, are about as easily relieved by drainage as any local phlegmons. The duration of the discharge of pus varied greatly, lasting in some of the appendiceal cases as long as three weeks.

The gastric contents escaped from the pelvic drain as long as 3 days, as shown in case of Mr. C. cited above. There were no fecal fistulæ.

The period of time that elapsed between the moment of perforation and the time of operation varied considerably. In the duodenal case it was eight hours, and the leukocyte count was 23,400 just preceding the operation, showing that notwithstanding the supposed mild virulence of the peritonitis in the duodenal cases there was a high leukogenetic response.

The gastric perforations were operated eight and fourteen hours respectively after the perforation.

In the direct perforations of the appendix into the free peritoneal cavity one can accurately estimate the time of perforation, but in the circumscribed abscess variety it is difficult to say just when the abscess ruptured into the free peritoneal cavity. We based our calculations in these cases on the sudden increase in pain, enlargement of inflammatory zone, nausea and vomiting, interposed on an already existing clinical case of appendicitis. On this basis of calculation a period of forty hours was not exceeded from the time of the perforation to the operation, while many of them had suffered from the appendicitis for 3, 4, 5, 6, and even 7 days. The degree of abdominal distension, intensity of intoxication, or facies Hippocratica were no indexes to the length of time that had elapsed since the free perforation, as many cases of circumscribed abscess have all these symptoms. The earliest operation was three hours after the onset of the perforation symptoms, the latest forty hours; twenty-two to thirty hours was the most common period.

The author wishes to thank the family physicians for reference of cases and to congratulate them on their early diagnosis and prompt demand for surgical relief in these cases; to them he feels belongs much of the credit for the good results secured, as in this class of cases early diagnosis and early surgical intervention are indispensable to success and are truly life-saving.

There were no deaths from the peritonitis *per se*. When the plan of treatment outlined was first instituted, we believed the recoveries were coincidents. Now the number is so large and the results so uniform that we cannot refrain from concluding that they are the legitimate sequelæ of the treatment. Contrast the results of the last five years with those of the preceding five. The infections in perforations of the alimentary canal, we believe, have been and will be practically the same each succeeding decade; therefore we cannot attribute the results to a change in the virulence in the infection. We believe also that the constitutional resistance, and the individual and local immunities are the same as they were in the preceding decades. We know of the appalling mortality which accompanied perforative peritonitis in every decade of the last century. We know that it is less than ten years since we announced that these cases of general diffuse free peritonitis would practically always prove fatal. We apologize for our predictions. We believe, and that belief is based on the facts cited in this paper, that the results of the future can and will be uniformly good. This estimate involves the assumption that the medical profession will make early diagnosis, will insist on early surgical intervention, will limit its surgical procedures to the least possible handling and trauma consistent with closure of the opening and relief of pus tension, will limit the durations of anæsthesia and quantity of anæsthetic, will shorten the actual time of operation, will insure the continued absence of pus tension, will eliminate the sepsis already in the blood, restore the blood pressure, and will inhibit septic absorption by position.

None of the above can be considered, individually, a life-saver, but each plays an important rôle in securing the present good results.

Albrecht. Zeitschrift f. Geburtsh. u. Gyn., bd. 61, hft. 1, 1907.

Ashdowne. Lancet, vol. 1, 1906, p. 155.

Bail. Arch. für Hygiene, lii, 1905, p. 272.

Blake, Joseph A. Amer. Journ. Med. Sciences, vol. cxxxiii, p. 454.

Borchardt. Deutsche Med. Wochenschrift, 1904–1906.

Buxton. Journ. Med. Research, viii, 1905, p. 305.

Buxton. Journ. Med. Research, vol. xv, 1906, p. 18.

Buxton, Dudgeon, and Sargent. The Bacteriology of Peritonitis, A. Constable & Co., Ltd., London, 1905.

Buxton and Torrey. Journ. of Med. Research, vol. xv, p. 5.

Buxton and Tracy. Journ. Med. Research, vol. xvii, 1907, p. 1.

Clairmont and Haberer. Arch. für. Klin. Chir., bd. 76.

Corner. Erasmus Wilson Lectures, 1904.

Corner, E. M. Op. cit.

Cushing. Johns Hopkins Bull., May, 1899, p. 75.

Cushing, Harvey. Johns Hopkins Reports, vii, 1904, and Johns Hopkins Bulletin, May, 1899, p. 75.

Dieulafoy. Clinique Medicale de la Hôtel Dieu, 1898, p. 396.

Diez and Compara. Giorn. Assoc'n Med. Tor., lxix, 1906, p. 53.

Dudgeon and Ross. Amer. Journ. Med. Sciences, cxxxii, 1906, p. 37.

Dudgeon and Sargent. Bacteriology of Peritonitis.

Durham. Journ. Path. & Bact., 1896–7, vol. iv.

Durham, H. D. Medico-Chirurg. Transactions, 1897, vol. lxxx, p. 191, and Journ. Path. & Bact., vol. iv, p. 338.

Exner. Zeitschrift f. Heilkunde, xxiv, 1903, p. 302, and Arch. f. Exp. Path., 1903, bd. 50.

Flexner. Phil. Med. Journ., Nov. 12, 1898.

Frankel, A. Wiener Klin. Wochenschrift, 1891, No. 13–15.

Fraser and Bowen. Lancet, vol. 1, 1906, p. 1591.

Ghon. Wien Klin. Wochenschrift, 1904, xvii, p. 267.

Gibson. Annals of Surg., April, 1906.

Glimm. Deutsche Zeitschrift f. Chir., bd. 83.

Glimm. Deutsche Zeitschrift f. Chir., bd. 83, 1906.

Goodman, Charles. Annals of Surgery, vol. lxvi, 1907, p. 161.

Grawitz. Charitè Annalen, bd. xi, 1886, s. 770.

Gruber and Durham. Wiener Klin. Wochen., 1896.

Harte and Ashhurst. Trans. Am. Surg. Assn., vol. xxi, 1903.

Heidenhain. Mitt. Grenz. der Med. und Chir., 18th bd., 1908.

Hoke. Centralblatt für Bakteriologie, xxxiv, 1903, p. 693.

Hotchkiss, L. W. Annals of Surgery, vol. xliv, 1906, p. 197.

Issaeff. Zeitschrift f. Hyg., xvi, 1894, p. 287.

Kelly, A. O. J. Phil. Med. Journ., 1899, vol. iv, p. 1032.

Klapp. Arch. f. Klin. Chir., lxxv, hft. 1.

Klencki. Ann. Instit. Pasteur, ix, 1895, p. 710.

Kolossow. Arch. für Mikrosk. Anat. 1893, bd. 42.

Larnelle. La Cellule, vol. lxi, 1889.

Lartigau. Studies from Dept. of Pathol. Coll. of P. S., Columbia Univ., 1900–2.

Laspèyres. Perforating Ulcers of the Duodenum, Am. Journ. of Obstet., vol. xlvi, No. 6, 1902.

Lennander. Deutsche Zeitschrift f. Chir., bd. 63, 14.

Lennander. Deutsche Zeitschrift f. Chir., 1902; ibid., 1906.

Lennander. Mittheil. a. d. Grenz. d. Med. u. Chir., 1902.

Lessage and Macaigne. Arch. de Méd. Exp., 1892, iv, p. 350.

Low. Med. & Surg. Rep., Boston City Hosp., 1900, p. 173.

MacCallum. Johns Hopkins Hosp., Bull. 1903, vol. xiv.

McGuire, Stuart. Journal A. M. A., March 28, 1908.

Malvoz. Arch. de Méd. Exp., iii, 1891.

Mayo-Robson. British Medical Journal, 1903, vol. ii, p. 242.

Meltzer and Auer. Transactions of the Am. Assoc'n of Physicians, 1904.

Mikulicz. Arch. f. Klin. Chir., lxxiii, 1904, p. 347, and Verhandl. d. 33. Kongress d. Deutsche Gess. f. Chir., 1904.

Mikulicz. Intern. Text-Book of Surg., p. 324.

Munro, J. C. Keen's "Surgery," vol. iii, p. 767.

Muscatello. Virchow's Arch., Bd. cxlii, 1895.

Muscatello. Virchow's Arch., Bd. cxlii, 1895.

Noehren. Annals of Surg., Feb., 1908.

Pawlowski. Virch. Arch., bd. 48.

Peiser. Brun's Beiträge, bd. 45.

Publications Massachusetts General Hospital, Feb., 1906.

Rinne. Arch. f. Klin. Chir., bd. xxxix.

Rinne. Arch. f. Klin. Chir., xxxix, s. 1, and others.

Schnitzler and Ewald. Deutsche Zeitschrift f. Chir. Bd. 41.

Sondern. Am. Journ. Med. Sciences, 1906, cxxxii, p. 889.

Tavel and Lanz. Mitth. a. Klin. und Med. Inst. d. Schweiz, 1893, b. 1.

Tavel and Lanz. Revue de Chir., Paris, 1904.

Torek, Franz. Med. Rec., vol. lxx, 1906, p. 849.

Vaughan. Med. News, Dec. 23, 1893.

Veillon and Zuber. Arch. de Méd. Exp., July, 1898.

Walthard. Arch. f. Exp. Path. und Pharm., 1892, xxx, s. 275.

Waterhouse. Virchow's Arch., bd. 119.

Wegner. Arch. f. Klin. Chir., bd. xx, 1887.

Wegner. Langenbeck's Archiv., bd. xx.

Wells and Mendel. Am. Journ. of Physiology, xviii, 1907, p. 156.

Woolsey, Geo. Annals of Surg., xliii, 1906, p. 652.

Young, Hugh. Johns Hopkins Reports, 1900–?

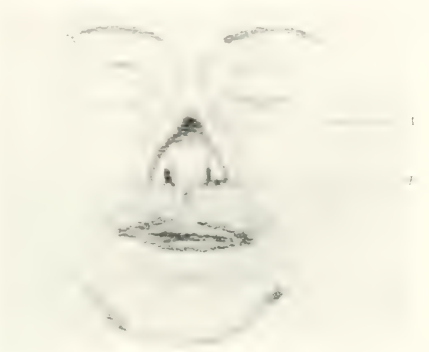
AN OPERATION FOR THE REPAIR OF SUNKEN NOSE[1]

By J. F. BINNIE, Kansas City, Missouri

INNUMERABLE operations have been devised to correct the deformity caused by destruction of the nasal bones and septum. Ch. Nelaton & Ombrèdanne devote a book of 432 large pages to a proper description of rhinoplasty. When, in 1907, a young woman came to me with a distressing deformity (sunken nose, not saddle nose), due to the destruction of the cartilagenous septum but not of the nasal bones, from infantile syphilis, I consulted the aforementioned excellent work on rhinoplasty with a confidence which was not justified. I found practically everything except what was required. The case history is as follows:

Miss N, aged 22, referred by Dr. Hornbach, Nevada, Missouri. Father and mother alive and well. Children, older and younger than patient, all well. When 9 years of age, patient suffered from nasal catarrh (?) which destroyed the cartilagenous septum and led to perforation of the palate. Under specific medication the palatal defect closed. Examination, December, 1907. The anterior portion of the nasal septum is absent. The nasal bones are intact, as are also the soft parts. All the unsupported parts of the nose have sunk inwards, as if an attempt had been made to suck them into the pyriform opening. This gives the sunken nose a somewhat clover-leaf appearance from in front.

Operation. With a very fine tenotome introduced through the skin, all the soft parts attached to the edge of the pyriform opening were divided subcutaneously. This permitted the nose to be pulled forwards into fair position. In the middle line, immediately below the bony bridge of the nose, a $\frac{1}{8}$-inch longitudinal incision was made. Guided by the finger in the nose, a tenotome was passed between the skin and the mucosa from this incision to the base of the ala of the nose on each side. From the lower edge of the thorax, two thin strips of costal cartilage were obtained (by von Mangold's method) and were drawn through the subcutaneous tunnels made in the nose. These two strips of cartilage have remained in place and have converted a very distressing into a much less distressing deformity. I believe the result may be much improved by introducing a strip of cartilage longitudinally from just above the lower end of the nasal bones down to the tip of the nose (as Freeman introduces a metal strip for saddle nose) and by the insertion of a very thin scale of cartilage under the skin of each ala like a shingle.



Median longitudinal puncture is made at *A*. Subcutaneous tunnels made from *A* to *B* and *A* to *C*.

[1] Read before the American Surgical Association, May 8, 1908.

ANEMIC SPOT ON THE DUODENUM, WHICH MAY BE MISTAKEN FOR ULCER

BY WILLIAM J. MAYO, M. D., ROCHESTER, MINNESOTA

IT sometimes happens that it is difficult to secure a proper exposure of the first two inches of the duodenum in order that it may be inspected and palpated for the detection of ulcer. The usual method is to grasp the pyloric end of the stomach and pull it to the left as well as up into the abdominal incision in such a manner as to draw the first portion of the duodenum into view.

The arrangement of the blood vessels immediately distal to the pylorus is such that this traction may interfere with the vascularization,

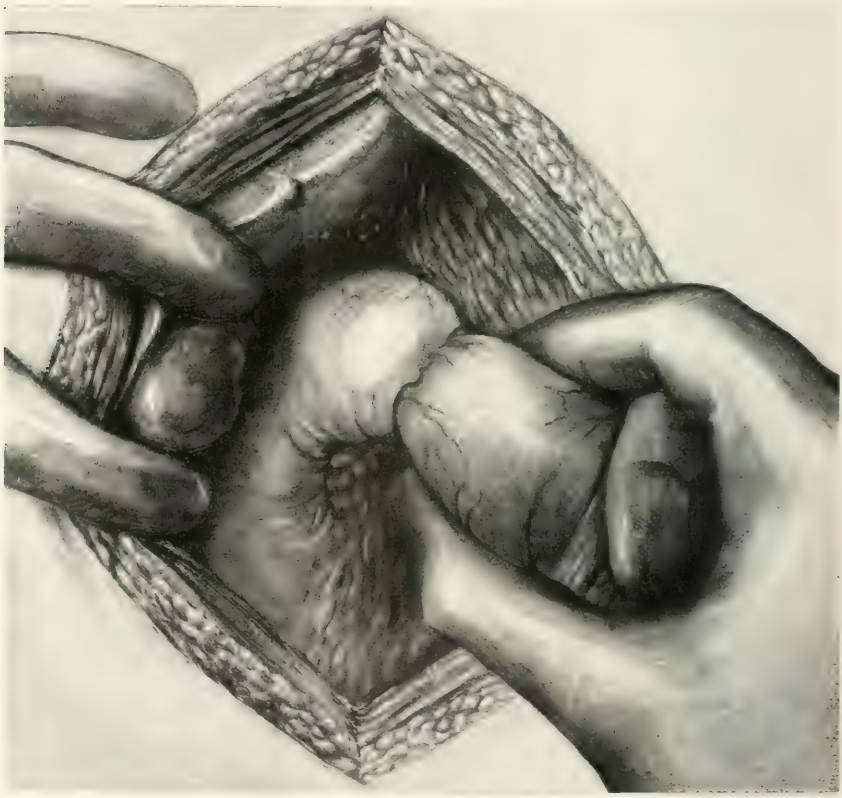


Fig. 1.—Anemic spot resembling an ulcer on the duodenum. Showing effect of traction on the pyloric end of the stomach for the purpose of exposing the pylorus and upper duodenum, which may cause an anemic spot resembling an ulcer to appear on the upper duodenum.

and the local anemia thus produced cause a white spot to appear on the duodenum just below the pylorus.

In some cases this appearance is very striking and may be mistaken for ulcer. In two cases in our early experience we were compelled to incise the duodenum at this point before we could convince ourselves that an ulcer was not actually present.

After one has had his attention called to this condition, the differentiation is not at all difficult. It will be noted that the peritoneum covering the supposed ulcer has not the characteristic milky color of true ulcer; there are no adhesions, and palpation does not reveal either thickening or cicatrix, and, of course, upon removing the traction the anemic spot disappears. (See Fig. 1.)

SUBSTITUTION OF WHOLE OR HALF JOINTS FROM FRESHLY AMPUTATED EXTREMITIES BY FREE PLASTIC OPERATION

BY PROFESSOR ERICH LEXER

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[illegible]

ATTEMPTS to restore motion to joints stiffened by bony anchylosis are of ancient date. The older methods met with little success. Forcible bending and breaking has been discarded, for it oftentimes causes severe injuries, while at best it produces but a renewed anchylosis in an improved position. None the less, even to this day, we hear of attempts of physicians to mobilize even a bony anchylosis by force, after trauma, joint luxations, and fractures. Danger lies in excessive stimulation, which the periosteum and periosteal connective tissue (capable of production of bone) suffer by renewed violence, not to mention a possible fat embolism. Bone proliferation occurs anew in the joint, capsule, and adjacent intermuscular connective tissue, leading again to anchylosis. This crude experiment is still more hazardous in synostoses following joint inflammation, as in tuberculosis, suppuration, gonorrhœal affections. Local recurrences, characterized by renewed and increased inflammations, follow upon tearing of the connective tissue capsule destined to prevent mischief arising from cicatrices containing bacteria. This is frequently associated with generalized disturbances due to entry of bacteria into the circulation. *Bony anchylosis can be removed by operation only.*

The oldest method, osteotomy, was limited to separation of bony masses adjacent to the synostotic joint (Rhea Barton, in 1826, sawed through a femur above the trochanter to overcome the effects of bony hip-joint anchylosis; this was followed later by subtrochanteric osteotomy), or to separation of the bony adhesions replacing the joint (Malgaigne-Dieffenbach). Analogous to a fracture which heals badly, or not at all, under insufficient immobilisation, a pseudoarthrosis should be procured by frequent agitation at the point of separation of the synostosis. It is well known how frequently this method was unsuccessful; indeed, it is quite natural that it should be so.

Resection of the synostosis may be considered a further step. Direct contact between the fresh bony surfaces lacking a reunion, may be retarded or avoided entirely by frequent movements. Simple resection may suffice in the arm and especially the shoulder, where gravity tends to hold the articular surfaces apart, thus counteracting the contraction of the intermediate cicatrix. In other cases, it is followed by the disagreeable state of *unsupported flail joint*, or one with fibrous anchylosis and *very little* motion; synostoses may also ensue. If, then, contraction was avoided by extensive resection, over-mobility without support resulted; while limited resections or simple osteotomies led to fibrous anchylosis, and were easily followed by renewed synostosis.

The experiment of Sayre and Defontaine to perform resection or osteotomy, in such a manner

as to fit the bony ends after the fashion of an articulation, procured support but could again produce adhesion. The idea must have been extant to prevent recurrence of synostosis after osteotomy or resection by imitating those conditions which, in fractures, are the cause of pseudoarthrosis. *Interposition* of soft parts, capsule, muscles, tendons, fat, form this cause. It can be easily executed. As well known, the inferior maxillary joint, which so frequently anchylosed again, even after the most extensive resections, was the first to be subjected to interposition of portions of capsule (Verneuil) and muscular flaps from muscles of mastication (Helferich-Lentz). Every living tissue has been tried. Pedicle and non-pedicle periosteal flaps, tendon (Quénu and Ombrèdane), pedicle skin flaps (Gluck), fat-fascia flaps (Murphy), have been used with varying success. The value of foreign substances, as gold, silver, magnesium plates, celluloid etc., was tested, even prepared or sterilised membranes, as pieces of pig's bladder or ovarian cyst, *were tried*! So much for interposition of foreign bodies. For two reasons, the idea does not seem feasible to me. Disregarding occasional difficulties in healing, we have to consider the inflammatory reactions produced by every foreign body, which indeed are necessary to produce proper encapsulation. This inflammatory reaction produces pain — a most disagreeable adjunct where extensive motion is required. The connective tissue proliferation is likewise not desirable, as it may form a nucleus for repeated anchylosis.

This also serves as objection to interposition of some kinds of tissue, when these are not introduced abundantly, and causes me to reject the otherwise interesting experiments of Kocher. This author placed the freshened surfaces in a position of luxation so that they did not touch. At the end of two weeks and after healing of the wound, he approximated them. Meanwhile, each of the bony surfaces was covered with a layer of granulations. This procedure has the advantage over the immediate approximation that it renders agglutination of the granular surfaces more difficult, while with early motion connective tissue adhesions are less firm. For this reason, Kocher considered this a step in advance. After all, this method, purporting nothing else than an interposition of young connective tissue, forms also the beginning of anchylosis fibrosa — a condition to be dreaded as the forerunner of bony anchylosis. It by no means represents the desired ideal. Summarizing the results of interposition of tissue or foreign bodies after osteotomy or resections, we find flail joints or pseudoarthrosis where we were successful enough to avoid recurring synostosis. This means that either the articular ends were separated by a broad space, did not grow together but were without support, or were close together, but a small space intervening, while motion was very limited. These two conditions may be equivalent to success or failure, depending upon the nature and mechanism of the joint involved. In some instances, a flail joint answers all purposes, as in the inferior maxillary joint, or even the shoulder joint; in others, the joint is useless, owing to lack of support and requires a brace. Again, a pseudoarthrosis may be exceedingly useful, because in keeping with the nature of a certain joint, and allow good motion; or excursion may be too limited in one direction and too extensive in another, owing to lack of joint inhibition. The form of the new joint surfaces is of great importance in all joints where inhibitory devices (elbow- knee-joint) against hyperextension and lateral deviation play a conspicuous part. The hip-joint requires head and acetabulum, the elbow an olecranon, the knee-joint closely fitting surfaces. Hence the separation of the synostoses should be accomplished in such a manner that the articular surfaces correspond approximately to the normal form of the joint. Flail joints without support are to be avoided, as we avoid recurrence of anchylosis by interposition of some material. If these demands are met, the desired ideal will be closer at hand. The substance normally covering the joint, i. e., hyaline cartilage, should be best suited for interposition. This idea was proposed and tried by Weglowski. I had intended, at my next synostosis operation, to cover the surfaces with plates of joint cartilage from amputated extremities, when the article by Weglowski appeared and showed me that the plan could be successfully carried out. The author, however, proceeded somewhat differently. He

implanted cartilage between the bony surfaces of a synostosis of the elbow after removal of superfluous bone, shelling out of head of radius and separation with imitation of normal joint contour. He took two pieces of cartilage from sixth and seventh rib, putting them one beside the other in such a manner that the perichondrium came in contact with the raw surface of humerus. The patient died of pneumonia after five weeks, and it could be shown that the transplantation had been successful. The perichondrial side of the cartilage discs had grown firmly to the epiphysis of the humerus. At the margins the cartilage decreased, to merge without distinct boundaries with the surface of the bone. This proved the advantage of cartilage interposition; the transplanted pieces grew, not only to the one bone surface, but flattened out and covered the other as well. The functional result was likewise satisfactory. At the end of a month, the patient could flex and extend his joint within a range of 60° to 70° without limitation to pro- or supination. The operation was successful, despite the fact that only one articular surface had been covered with cartilage.[1]

My intentions from the beginning were to transplant upon both articular surfaces, and I have done this. *For both form as well as covering shall approach the normal joint as much as possible.*

My first case presented also a synostosis of the right elbow in a young woman, probably of gonorrhœal origin. From her right knee-joint, affected with fibrous anchylosis, I took the patellar surface of the femur in shape of a thin disc and divided this into two equal parts. Each one of these, consisting of articular cartilage, served to cover one wound surface in the joint, touching it with its own raw surface. After a transverse incision over and through the point of attachment of the triceps tendon, a new joint was formed in the synostotic elbow, somewhat curved to imitate the excavation of the ulna and the convex epiphysis of the humerus to a certain extent. The end of the radius was resected. The thin transplanted discs fitted well to the corresponding surfaces and were pressed closely into the new articular space. The skin wound was closed completely after fixation of triceps tendon to ulna and the extremity immobilised in extension. After four weeks, the dressing was changed and the elbow put up now in extension and then in slight flexion. Healing was perfect. Mobilty began to become more extensive in fifth week, when patient left clinic. She was extremely sensitive and afraid of pain during motion. The final result is not known.

At the next occasion, I proceeded another step forward and *the desire to produce normally formed and normally covered joint surfaces led me to transplantation of an entire knee-joint* from a newly amputated lower extremity. The patient, an 18 year old girl, suffered from bony anchylosis of the knee-joint, due to articular suppuration after purulent osteomyelitis of the femur. The joint was fixed in acute flexion. An anterior flap incision, with the basis above the condyle and lower and somewhat below the tuberosity of the tibia, exposed the synostosis. All the soft parts remained in contact with the flap: the detached ligamentum patellare proprium, fibrillated and thinned by suppuration, the remainder of the joint capsule, and the ligaments, as well as muscular attachments. The patella remained likewise attached to the flap, it had to be chiseled from the femur. All lateral and posterior coverings were detached with like caution by sharp or blunt dissection, so that every thing remained attached to soft parts of popliteal space.

Owing to pronounced flexion of the joint, resection had to be cuneiform to have the surfaces form a right angle with their respective bones. The new joint was fitted into the defect, amounting in the extended extremity to the width of three fingers. It was obtained from a limb amputated simultaneously for senile gangrene (without phlegmon) and consisted of both epiphyses with crucial ligaments and semilunar cartilages. Each epiphyseal portion measured about 1½ fingers. Both projected laterally beyond margins of tibia and femur, and required trimming. Each was fastened with a nail. The ligamentum patellare proprium was attached to the tibia after replacing the flap; skin suture without drainage. Unfortunately, the interposition of soft tissue or cartilage beneath the patella (pre-

[1] Weglowski, Die Behandlung der Gelenkankylosen vermittelst Überpflanzung von Knorpelplatten. Centralblatt f. Chirurgie, 1902, No. 17.

viously detached by chisel), to prevent adhesion to the femur, was omitted. This required renewed interference. However, it permitted positive proof of complete union. Fixation by plaster cast from the toes beyond the iliac crests.

The cast was interrupted from middle of leg to middle of femur and bridged over by several iron bands. This allowed complete immobilisation, combined with ready accessibility. The wound healed smoothly. Cast was removed after seven weeks and active movements begun cautiously. Extensive movements were opposed by renewed union between patella and femur. I decided upon complete removal of the former, and for this purpose detached the lower half of the flap, about three months after the transplantation. This permitted exact orientation. All expectations were realized. The epiphyses were in firm union with the corresponding sawed surfaces of tibia and femur. The union was so complete that it did not allow even a trace of motion. The semilunar cartilages and crucial ligaments were preserved, the articular cartilages were smooth, without fibrillation. The interarticular space contained some blood fibrin which could easily be detached. Around the joint a connective tissue callus had formed, containing the remainder of ligaments and capsule as well as the tendons. The epiphyses were firmly healed beyond doubt. Were they viable however? Was there a connection with the general circulation? To prove this, I removed with a fine chisel a small spicule of bone from tibia in such a manner that it contained the following elements: A piece of articular cartilage, the spongiosa of the transplanted epiphysis, the connection of this with the old tibia and on the outer side the periosteal covering of the transplanted portion. The wound of the epiphyseal spongiosa showed sufficient bleeding medullary space, to permit on macroscopic inspection even the conclusion that the transplanted portion had become part of the new organism. Microscopical examination revealed firm fibrous and bony union, also new vessels and bone lamellæ in the medullary spaces. The greater part of the cells of both corticalis and articular cartilage took the stain well. I cannot enter here into further histological details. A second transplantation for bony anchylosis of a tubercular knee-joint was likewise successful. The entire knee-joint was again taken from a freshly amputated limb. Technically the second case differs, inasmuch as the epiphyseal portions were not as wide as in the previous one (on account of less drastasis), and wire was used for fixation instead of nails. The ligamentum patellare proprium was entirely absent; for this reason I reflected two fascio-muscular flaps from the leg upward and sutured them to the lower margin of the patella (Fig. 1).

Both cases show now (the first 5 months, the second 9 weeks after transplantation) upon X-ray pictures excellent position of articular surfaces and transplanted epiphysis. Fibrillation of articular cartilage can nowhere be observed. The operated extremities are somewhat shorter than the sound ones. The knee-joint is usually in a position of normal extension. Lateral motion is present to a very slight degree in the second case; in the first one it has entirely disappeared. The patients can bear their weight upon the extremity during standing or walking without lateral deviation of joint to either side. There is no pain while bearing weight.

The next step in both cases shall be to obtain as good function as possible by muscle-plastic, i. e., elongation or transposition of efficient non-atrophic muscles. The sartorius may serve in the second case as a substitute for the missing ligamentum patellare proprium and for strengthening the quadriceps. In the first case, elongation of a tendon may suffice. Operative improvement of function could not be hastened, as liberal time allowance must be made for the healing of such extensive bone and cartilage transplantations. Frequent exercises within the limits of active mobility were ordered to strengthen the muscles and keep the joint active. Active motion is still considerable less than passive, on account of the contracted muscles. The first older case permits passive motion up to 45 degrees. Even now, though much remains to be done, the success of both operations is great. The possibility of organic incorporation of a transplanted joint taken freshly from man is proven. This promises well for the future. For the ideal in the successful

Fig. 1.

Fig. 2

treatment of synostotic joints, namely, nearly normal joint form and lining, is reached here a priori by transplantation of fresh human joints. Other cases show that substitution of half a joint can be as easily accomplished as that of an entire joint after resection of synostoses. Here, however, we deal not with the removal of joint anchyloses, but with operations which previously were always followed by intentional or unintentional anchylosis. Tumors of bone, demanding resection in continuity with adjacent articular portion, are the causes for these operations.

The first case was that of a cystic central sarcoma in the upper portion of the tibia, in a man 38 years old. The affected portion could be resected, as the corticalis was everywhere intact. This was done after detaching the soft parts by a large flap incision with the basis opposite the joint line. As, however, the tumor came almost up to the articular cartilage, this had to be removed. This necessitated resection of the whole upper end of the tibia, amounting to somewhat more than the upper third. Periosteum was removed. Tendons and capsule attachments were detached and remained in connection with the large anterior flap or the other soft parts. There was no periosteum in the defect. A freshly amputated leg served again as substitute. A portion of tibia, corresponding exactly to the one removed, was taken from the amputated limb together with periosteum and articular cartilage and put into the defect. To save the body the task of absorption of decomposition products of transplanted bone marrow, I filled the marrow cavity with iodoform plug after removal of the marrow, as I have done before in many free plastic bone operations. The lower end was cut somewhat pointed to fit into the diaphyseal end of the tibia. The ligamentum patellare proprium was sutured to the tibial tuberosity of the substituted piece and the capsule to the periosteum. Here again complete healing followed. The Roentgen picture (Fig. 2) shows at this date, 5 months after transplantation, no fibrillation of the cartilage; the articular surface of the tibial substitute fits well to that of the femur; lateral motion is absent and flexion as well as extension nearly normal (Figs. 3 and 4). On walking, the patient finds firm support upon the operated leg. A thick callus has produced firm union of the substituted piece. At the end of

Fig. 3.

Fig. 4.

two months, the X-ray picture showed activity of the transplanted periosteum by production of new bone deposits in various places. In consequence, there can be no doubt that the function of the knee-joint will improve further, and that endurance in walking will increase. As the attachment of the crucial ligaments is missing, a degree of uncertainty may remain. The fact that the transplanted tibia was taken from the right leg to be placed into a left one led us to fear that the joint surfaces might fit badly and lateral mobility might ensue. This, strange to say, did not occur, perhaps on account of rapid rounding off after movements. In similar manner and with like success, I substituted the upper two-thirds of the left humerus, removed with articular head and periosteum for central fibrous sarocma in a young man. The lower portion of the femur of an amputated limb was taken, as a disarticulated arm was not at hand. One condyle was shaped like the humeral head. A purse-string suture was passed through the margin of the joint capsule, the substitute was placed into the glenoid fossa and the suture drawn together over it. The capsule was fastened to the bone by a few nails. Connection with the shaft of the humerus was effected by means of a bone peg. A portion of the fibula of the amputated leg, 8 cm. long and covered with periosteum, served for this purpose. The peg was pushed halfway into the marrow cavity of the humerus and the same distance into that of the transplanted femur. Here, also, uninterrupted healing took place. The patient is now commencing with active motion. Passive motion in the joint is extensive.

Concluding, I may mention the substitution of a proximal phalanx in the 4th finger of the left hand of a 20 year old girl. A large enchondroma demanded removal of the proximal phalanx. Owing to the extent of the enchondroma, periosteum, articular cartilages, head, or basis could not be preserved. The foot of a

man, amputated a few hours previous, offered material. Proximal phalanx of second toe with both articular ends appeared most suitable, though a little shorter than the one removed. Fixation of capsule, was not successful, as the suture tore out easily. For this reason, the transplanted bone was merely placed in proper position in the wound and retained in place only by suture and dressings. Healing was perfect. The joints are movable.

These operations enabled us, then, by substitution of articular portions removed, to preserve for the patients movable joints. In former times, the result in the first case would have been a materially shortened limb with stiff joint by fitting the stump of the tibia into an opening in the articular surface of the femur. The second case without substitution of bone would have required a prothese; while in the third, as indeed originally planned by me, a disarticulation of the finger would have had to be done.

SURGERY OF THE GASSERIAN GANGLION

BY STEPHEN H. WEEKS, M. D., PORTLAND, MAINE.

NEURALGIA of the face is of very common occurrence, and often entails an almost insupportable amount of suffering, rendering life absolutely one of incessant torture. The intermittent form of the disease, depending upon malarious influences, generally very readily yields to quinine, accompanied by a proper regulation of the diet.

The case is very different when the disease is occasioned by organic lesion of the fifth nerve, or of the Gasserian ganglion, from the branches of which the fifth nerve arises. Under such circumstances, a cure can be effected only by thorough excision of the ganglion, an operation which has now been so often practiced as to entitle it to be regarded as one of the established procedures in surgery. The two nerves requiring excision for neuralgia are the second and third branches of the fifth pair, which may suffer either separately or simultaneously, although the former is much more common.

It is not the province of this paper to consider the superficial neurectomies in persistent neuralgia of the head and face, other than to say that the results so far obtained in the intracranial operations do not justify the surgeon in the abandonment of the extracranial operations. The extracranial neurectomies certainly justify the expectation that they will afford great and often permanent relief. Up to this time, it seems to me that every method of treatment should be exhausted before removing the Gasserian ganglion. This, although one of the most difficult operations in surgery, does insure long immunity.

ANATOMY

Both motor and sensory roots of the trifacial pass downward and forward through an aperture in the dura, which lies under cover of the tentorium cerebelli and a little to the outer side of the apex of the petrous portion of the temporal bone, to enter Meckel's space between the supporting and periosteal layers of the dura mater, in which space the sensory portion enlarges into the Gasserian ganglion. This ganglion, of somewhat semilunar form, with convexity forward, rests in a special depression upon the anterior surface of the petrous bone, near its apex, and also to a slight extent upon the cartilage which occupies the foramen lacerum medium. Its upper surface is firmly attached to the dura (roof of Meckel's space), its lower surface less firmly (to floor of Meckel's space). Its inner part lies near the posterior extremity of the cavernous sinus and the internal carotid artery. It is important to remember the above relations, lest these important blood-vessels be wounded during the removal of the ganglion, which would give rise to troublesome hæmorrhage. The motor root and the large superficial petrosal nerve lie beneath the ganglion. From its convex

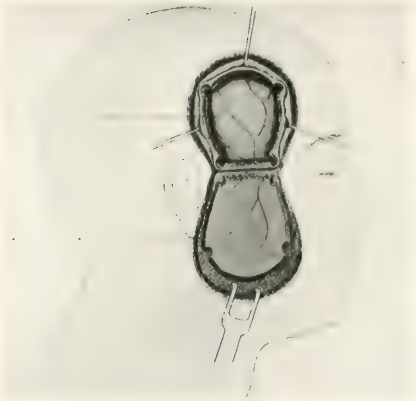

Fig. 1.

Fig. 2.

antero-external border are given off, first, the ophthalmic passing out through the sphenoidal fissure; superior maxillary, passing through the foramen rotundum; inferior maxillary, passing out through the foramen ovale and being joined immediately after its exit by the motor root, which also passes through the foramen ovale separately.

OPERATION

The operation which I have always employed, and the one at present most generally used, is the intracranial extradural method of Krause-Hartley.

Preparation of the Patient. The patient should be in bed for two or three days and kept on his ordinary diet, but not a heavy one. A careful and full examination should be made, including the heart and lungs, the pulse at each wrist, and the urine. His bowels should be moved by an aperient. It is better to give the cathartic the night but one, or early in the day, before that of the operation, with the object of not disturbing the patient's rest on the night immediately preceding the day of the operation. An hour before the operation, a pint of normal salt solution with a tablespoonful of brandy should be given as an enema. This will be gradually absorbed and supply the blood during the operation. It is needless for me to say that the most thorough asepsis should be observed in every detail. The day before the operation the entire scalp should be shaved and thoroughly scrubbed with soap and water and then with ether, and 1 — 2000 solution of bichloride of mercury, and the head covered with sterile gauze.

The Anæsthetic to be Used. Sir Victor Horsley uses chloroform in all operations on the brain, claiming there is less hæmorrhage. I have always used ether, and have never had any troublesome hæmorrhage. In my hands, ether is much the safer anæsthetic. The operation consists in an osteoplastic resection of the temporal region, with temporary turning down of a flap of bone and soft parts, and a separation of the dura mater from the middle fossa of the skull, the ganglion and the three divisions of the fifth nerve being exposed without opening the dura. A horseshoe-shaped incision is made over the temporal region, its anterior extremity being near the external angular process of the frontal bone, its posterior extremity near the tragus of the ear, and the highest part of the curve reaching the supratemporal ridge. The above incision passes through all the soft tissues and periosteum directly to the bone, along the entire line. With the periosteal elevator, the soft parts of the flap are freed from the bone to a slight

extent only, around the entire incision line, the freeing at the two ends of the base-line being a little more extensive. Throughout the rest of its extent, the soft parts remain adherent to the underlying bone. In my last two operations I have used a small trephine of about one-half inch in diameter to remove two discs of bone, the anterior one having its center over the tip of the sphenoid wing, the posterior one having its center over a point one inch vertically above the external auditory meatus. From these trephine openings, the dura is separated as far as possible, both along the straight basal line connecting the two openings and in the direction in which the convex bone-section is to be made. A section of bone similar in shape to the skin incision, but somewhat smaller in size, is now made. This section is made from the squamous portion of the temporal and greater wing of the sphenoid, the basal attachment being somewhat narrower than the greatest transverse measurement of the convex portion. I am in the habit of using a special chisel cutting a triangular groove, for making this bone section; the section beginning at one trephine opening, and ending at the other, care being taken not to wound the dura. The bone being thus cut through everywhere except across its basal line, some stout instrument (such as an osteotome or elevator), is inserted into the groove at its greatest convexity, resting against the parietal bone as a fulcrum — then with sharp, sudden movement, the flap of skin, muscle, and bone is pried outward and downward, generally snapping directly and evenly across the basal line, just above the zygomatic arch, and remaining hinged by the soft parts and exposing an area of brain, covered by the dura mater, two to three inches in diameter. If the middle meningeal artery is injured, as it sometimes is, it is tied as near the foramen spinosum as possible. If more room is necessary, the basal line of bone may be cut away, to any desired extent by the rongeur forceps. The dura mater and temporosphenoidal lobe of the brain are now separated from the middle fossa of the skull. This is done in the direction towards the apex of the petrous portion of the temporal bone, and is best accomplished by the fingers. Sometimes the dura is torn, and sometimes the middle meningeal artery is ruptured requiring temporary packing of the groove to control the hæmorrhage, where ligature is impossible.

The three divisions of the nerve are now seen and can be traced back from the foramina. The positions of the internal carotid artery and cavernous sinus are located as nearly as possible, for the purpose of guarding them against injury. The advisability of removing the first division is doubtful, because of the trophic changes which follow in the eye. I do not remove the ophthalmic branch, and I have had no trouble with the eye following the operation. It has been said that the motor root should be left undisturbed. I do not see how this can be done. In all my operations, I have cut everything that goes through the foramen ovale, including, of course, the motor root, and I have had no paralysis of the muscles of mastication. I have found that it facilitates the operation to divide the second nerve close to the foramen rotundum, and the third close to the foramen ovale, and dissect those back to the ganglion. After this has been done, if the divided end of the third branch be seized with the forceps and firm traction made upon it, the ganglion will be lifted from its bed, and as much of the ganglion can be cut away with the scissors as is desirable, leaving untouched the first division, with its corresponding part of the ganglion. I have never found it necessary to divide the operation into two stages. I have never found the hæmorrhage at all troublesome. It has always been readily controlled by gauze packing for a few minutes. In one case I left the gauze in for twenty-four hours.

Th chief dangers of the operation are, injury to the internal carotid artery and cavernous sinus; laceration of the brain; injury to the nerves of the eye, hæmorrhage from the middle meningeal artery and sepsis. In the four operations which I have made, none of these dangers were encountered.

After the dura mater has been separated from the middle fossa, the brain can be gently lifted from the fossa, exposing the nerves, by a special retractor which I had made. One end is made just wide enough and tapering enough to fit in between the petrous portion of the temporal bone and the lesser wing of the

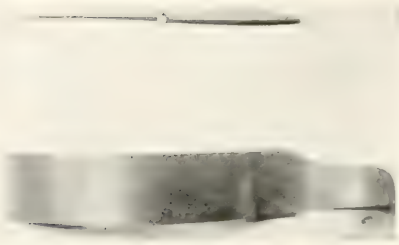

Fig. 3

sphenoid, extending down to and exposing the three branches of the fifth pair.

I show here a photograph of the retractor. I also show a photograph of the steel hook used in making traction on the nerves before they are divided. (Fig. 3.)

REPORT OF MY LAST CASE

Mrs. T., age 45, married, had suffered nine years from severe neuralgia of the superior maxillary nerve. This nerve was removed in the usual manner and she was free from the pain for three years. At the end of this time it returned and it was decided that the best thing to be done was to remove the Gasserian ganglion.

The operation was made at the Maine General Hospital, December 5, 1907, assisted by Dr. H. H. Brock, one of the surgeons of the hospital. The operation was made as described above and was free from any complication or mishap. What hæmorrhage there was, was readily controlled by gauze pressure continued for a few minutes. The two special instruments which aid in this operation are here described and illustrated. The elevator, which is made of german silver and pointed at one end so that it shall fit in between the petrous portion of the temporal bone and the lesser wing of the sphenoid, is used to lift the brain from the middle fossa so that the nerves and ganglion are thoroughly exposed and dealt with as desired. The second instrument is a hook of steel made with a long handle so that the nerves can be easily reached — the hook is passed beneath the nerves which are put upon the stretch before they are divided. At the same time the nerves can be separated from their sheath of dura mater as far back as the ganglion. The superior maxillary is first divided close to and even into the foramen rotundum. No further traction is made upon this nerve. While the inferior maxillary nerve is being put upon the stretch with the hook, the nerve is cut close to and even into the foramen ovale. Scissors with a long handle and narrow blades are used for the division of the nerves. This nerve being cut, the proximal end is seized with firm grasping forceps, and as traction is made upon it, the ganglion is lifted from its bed and can be cut away to any desired extent. After removing the ganglion and arresting all hæmorrhage, I packed the foramen rotundum and foramen ovale with Sir Victor Horsley's aseptic wax. The object I had in view in doing this was to prevent any union with the ends of the divided nerves. After all hæmorrhage had ceased, the bone was replaced and the incision in the soft parts closed with catgut suture. A strip of gauze was introduced through the posterior part of the opening between the scalp and the bone for drainage. There was no drain introduced between the brain and skull. A microscopic examination by the pathologist of the nerves and ganglion removed, showed bundles of nerve fibers cut in longitudinal and cross section, also two areas of ganglion cells. The ganglion cells were swollen and hyaline, much distorted in shape, and without nuclei. The nerve fibers show their axis cylinders in many places swollen, broken, kinked, and distorted. Frequently, the axis cylinder has disintegrated and disappeared altogether. There was no infiltration with round cells. Here and there a little free hæmorrhage into tissue. Some hyaline changes in the epineurium. Diagnosis made by the pathologist was degeneration of the ganglion cells and nerve fibers.

The operation made on this last patient was followed by almost no reaction — temperature and pulse after the first 24 hours were practically normal. The patient began to sit up on the eighth day, and on the twelfth day she left the hospital and went to her home ten miles away — riding about three miles in an open carriage. The pain was completely relieved, no impairment of motion of mastication, no trouble with her eye, but considerable loss of sensation on side of the face corresponding with side of the operation.

Mr. James K. Preston came to the Maine General Hospital, April 27, 1907, under the care of Dr. Wm. H. Bradford, surgeon on duty at that time. He gives the following history. Had facial neuralgia for twenty years or more, involving the right side. Nine years ago had the superior maxillary nerve removed, which gave relief for fourteen months. Two years after the first operation, the inferior dental nerve was removed. This operation was made through the mouth. The operation was followed by relief of the pain for about one year. At the time of the operation the pain involved the whole side of the face. The operation for the removal of the Gasserian ganglion was made by Dr. Bradford, May 1, 1907.

The usual osteoplastic flap was made and the ganglion readily reached by raising the temporosphenoidal lobe from the middle fossa. The ophthalmic branch and its corresponding portion of the ganglion were left undisturbed. Ether was the anæsthetic used and the hæmorrhage was readily controlled by gauze pressure. May 17th, the right eye, corresponding to the side of

operation, was closed, sight not affected. There was distinct ptosis for several weeks. This gradually passed off. The pain was wholly relieved and he left the hospital, June 7th, cured, as the records say. For several weeks after the operaton the mind was a good deal disturbed. This gradually passed off, and when he was discharged, his mind was clear.

It has been suggested by Abbe and others, when the disease is limited to the second and third division of the nerve, to resect a small portion from these branches as they enter the foramina and leave the ganglion undisturbed, preventing reunion of the divided ends by placing a folded piece of rubber protective tissue between the divided ends or filling the foramina with paraffin.

Harvey W. Cushing exposes the ganglion by a lower incision similarly curved. The temporal muscle and zygoma are divided in the line of incision, and both turned downward, exposing the lower portion of the temporal fossa of the skull. This is broken through with a chisel and the opening enlarged with the rongeur forceps. The dura, with the middle meningeal artery, is gently retracted and the ganglion exposed as in the Hartley operation. The advantages claimed for this operation are, that there is little or no danger of wounding the middle meningeal artery, and as the opening in the skull is nearer the ganglion, its exposure can be accomplished with a minimum amount of retraction and compression of the brain. Ptosis, paralysis of the muscles of the eye, etc., may occur as a result of injury to the third, fourth, and sixth nerves. One may avoid these conditions by keeping away from the first division of the fifth nerve and the immediately adjacent third, fourth, and sixth nerves during the course of operation.

SUMMARY

The operation for the removal of the Gasserian ganglion as a primary operation for the relief of tic duoloureux is not justifiable. The extracranial operations upon the branches of the fifth cranial nerve should first be made, which almost invariably give temporary relief, and not infrequently relief is permanent. The greatest care should be used in preparing the patient for the operation, and strict asepsis should be observed through every step of the operation.

The osteoplastic flap in the temporal region, called the Hartley-Krause operation, is the one I have always made use of. A pint of normal salt solution with an ounce of brandy should be injected into the rectum, about half an hour before the operation commences. This is absorbed during the operation and supplies, to a considerable extent, the amount of blood lost during the operation. The question of anæsthesia during operation on the brain is an important one. In all my operations on the brain I have used ether as an anæsthetic. Sir Victor Horsley uses chloroform only. He claims that ether causes a rise of blood pressure and an increase of blood venosity, and therefore much additional and troublesome hæmorrhage. Chloroform, on the contrary, causes a fall of blood pressure with less blood venosity. He uses the Vernon Harcourt's apparatus by which it can be used in known quantities.

Put the second and third divisions upon the stretch with the blunt hook and divide them close to the foramen rotundum and foramen ovale respectively, dissect them back to the ganglion and life the ganglion from its bed by making traction on the inferior maxillary nerve, having first divided the superior maxillary nerve, and remove the parts of the ganglion corresponding to these divisions, leaving untouched the first division, with its corresponding ganglion. If the first division of the nerve and its corresponding portion of the ganglion be retained, there will be no danger to the eye, and the only protection to the eye needed will be a simple compress and bandage. Bleeding may be so great as to compel the operator to pack and finish the operation in two stages.

Sometimes the dura mater is considerably torn and the cerebrospinal fluid escapes during the manipulation of the brain. This has occurred several times in my experience. I have never seen any bad results follow. In fact, it has seemed an advantage inasmuch as it has enabled me to lift the temporosphenoidal lobe more freely from the middle fossa, thus giving a better view of the ganglion and its nerves. In my last case when the dura was dissected from the ganglion, quite a little brain matter escaped. No unpleasant symptoms followed. The mortality thus far in my hands has been nil.

A UNIQUE ANOMALY OF THE GREAT OR GASTROCOLIC OMENTUM[1]

BY WILLIAM M. MASTIN, M. D., Mobile, Ala.

Lee Betts, male, 26 years old, a muscular negro of a pronounced Guinea Coast or Congo type, was admitted to the surgical wards of the Mobile City Hospital, July 15, 1904, suffering from a penetrating shot wound in the left lumbar region, about three inches to the outside of the vertebral spines and two inches above the iliac crest. The wound had been inflicted by a gun loaded with No. 4 shot, and was delivered at close range, as indicated by shell wads lodging in the soft tissues of the back. The injury had been received some fifteen hours before admission; symptoms of intestinal perforation were marked; and his general condition was extremely bad.

Cœliotomy was performed at once, the abdomen being opened in the mid-line below the umbilicus. The cavity was filled with blood and intestinal contents, and eight perforations of the intestines — four in the small gut and four in the under surface of the transverse and descending colon — were found and sutured. Encountering some difficulty in bringing the colon into the wound, due to what seemed to be extensive and unyielding adhesions between the omentum and the abdominal parieties, the incision was extended some distance above the umbilicus to secure more space, and, at the same time, for examination of the contents of the upper abdomen. It was now discovered that the apparent adhesions consisted of the anomalous omentum, misplaced and shortened, which extended as a diaphragm across the entire abdomen, shutting off completely the upper abdominal space with its contents from the remainder of the abdominal cavity. This omental partition was much denser than the normal tissue of the omentum, its surface was smooth and glistening, like the parietal peritoneum with which it was continuous and inseparable. It was decidedly vascular — bleeding freely when incised. There was no evidence of any ancient peritoneal inflammation; there were no adhesions or bands anywhere; and the viscera were quite normal in appearance and position.

The critical condition of the patient rendered it necessary to desist from further exploration, and the abdomen was closed and the lumbar wound drained. Death resulted four days later from septic peritonitis.

Autopsy. The autopsy was performed a few hours after death by Dr. Douglass G. Campbell, of the Assistant staff. General septic peritonitis existed. There were three perforations of the posterior wall of the transverse and descending colon (which were not within surgical reach under existing conditions) and one in the small intestine, not discovered at the operation. The left kidney had a small, superficial, furrowed wound in its lower pole. None of the other organs were injured.

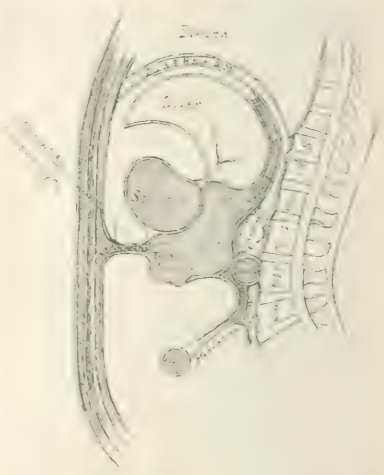

Diagram showing the relation of the diaphragm to the anterior abdominal wall

The chief feature was the anomaly of the great omentum, which formed a perfect partition, dividing the abdominal cavity into two distinct spaces, the upper and smaller space containing the liver, stomach, pancreas, and spleen (the kidneys being normally situated post-peritoneal, but within this limit), and the lower space holding the small in-

Read by title before the American Surgical Association, 1905.

testines, the under surfaces of the ascending, transverse, and descending, colon, the cœcum caput coli with the vermiform appendix, the sigmoid, and, of course, the pelvic organs.

The relations of the omentum to the stomach and transverse colon were apparently normal, but, instead of stopping with these natural limitations, the omentum continued on in unbroken attachment to the colon on each side, arching down in a manner similar to the curve of the true diaphragm, until the lateral abdominal walls were reached, with which it became a part. Thus, on the right side the border of the omentum extends normally as far only as the duodenum, but, in this case, it continued on in its colic attachment and merged into the ascending mesocolon and mesocœcum, by means of which it was connected with the posterior and lateral abdominal walls. The same anatomical association existed on the left side, the left border of the omentum blended normally with the gastrosplenic omentum, but also continued on into the descending mesocolon and mesosigmoid, and through these effecting its posterolateral attachments. From these posterior and lateral attachments, the omental diaphragm extended in front across the entire anterior abdominal wall, forming a complete partition as described. The omental diaphragm was not wrinkled or in folds, but somewhat tense, and the colon was held more rigidly than natural. The usual fatty consistency and cribriform appearance of the omentum were absent, and, instead, the tissue was dense, rather fibrous, resembling the peritoneal reflections forming the suspensory ligaments of the abdominal organs, and both the superior and inferior surfaces presented the appearance of peritoneum and were indistinguishable from it. The attachment to the anterior abdominal parieties at the median line was at a level of $2\frac{1}{2}$ inches below the xiphoid appendix, but gradually arched downward and backward, on either side to the points already designated. When incised, it was seen to be composed grossly of two distinct peritoneal layers, which anteriorly merged into, and were continuous with, the peritoneum of the abdominal walls — the upper layer being reflected upward and the lower layer downward. Enclosed between these peritoneal layers was a dense layer of adipose tissue, which was continuous with the preperitoneal abdominal fat (see diagram) and which was mistaken for such when cut into at the operation. The four peritoneal layers of the normal omentum could not be demonstrated by rough dissection. This false diaphragm varied in thickness from about $\frac{1}{4}$ to $\frac{1}{2}$ inch or more, the thinnest part corresponding to its gastric and colic attachments, and the thickest part where it united with the abdominal walls.

This case is a conspicuous example of the many surprises to be met with in the abdomen, and it seems to be without a parallel in the annals of medicine. As far as I have been able to ascertain, no instance of a like anomaly exists in the literature. After a fruitless search through my own private library, the services of Dr. Von Klein, the well-known medical collaborator, were secured, and he states that "after a thorough research from the 15th century to date, I now report to you that there is not a similar case in literature, nor in the illustrations of the numerous atlases on anomalies."

In addition to the peculiarities noted, it is obvious that the important office of the great omentum, as the chief guardian or protector of the abdominal viscera, was lost. The pendulous or apron-like folds not existing, necessarily the omental (or lesser peritoneal) cavity was largely curtailed, and, furthermore, the special function of the omentum of maintaining the warmth of the intestines, and erecting barriers against germ invasion and limiting foci of infection was entirely destroyed. This latter was evident in the general septic peritonitis that existed throughout the cavity.

It is to be regretted that circumstances prevented a more complete and accurate anatomical examination, especially of the lesser omentum, and the relations of the organs contained in the upper abdomen.

DIVERTICULUM OF THE VERMIFORM APPENDIX[1]

With Report of a Case

By GEORGE BEN JOHNSTON, M.D.
Professor of Abdominal Surgery in the Medical College of Virginia, Richmond, Virginia

THE following case of diverticulum of the vermiform appendix is reported because of its rarity. Prior to this time, only twenty-five instances of this condition have been recorded. These cases are collected in a very recent article by Isabella C. Herb [1], to which one may refer for an excellent résumé of the subject as well as for the complete bibliography.

The patient was a woman, 42 years old, who presented every evidence of an acute attack of appendicitis, with pain, nausea and vomiting, and muscle rigidity. As she was not seen until after the forty-eighth hour of the attack, it was deemed advisable to postpone surgical intervention, if possible, until after the acute symptoms had subsided. This was accordingly done and the patient was operated upon about ten days later, in July 1907.

Operation disclosed a large, swollen, and much-congested appendix, the base of which was particularly thickened and indurated. In addition, the wall of the cæcum surrounding the base of the appendix was hard and indurated so as to suggest malignant disease very strongly. For this reason, this portion of the cæcum was excised in one piece with the appendix and the opening in the intestine closed by suture. Recovery was uneventful and the patient remains perfectly well at the present writing.

In view of the pathological findings, it is of interest to note that the patient's history was absolutely negative as to previous attacks of abdominal pain.

The tissues removed were promptly sent to Dr. Joseph C. Bloodgood, of the Johns Hopkins Hospital, Baltimore, to whom I am much indebted for the full pathological report and the accompanying photograph.

GROSS PATHOLOGY

The alcohol specimen shows an appendix. The tip is surrounded by normal mesenteric fat, while the base toward the cæcum is enlarged and irregular in outline.

Diverticulum of appendix.

On section, the tip of the appendix is almost amputated from the remainder of the appendix. Between this and the base, the wall of the appendix is chronically thickened with partial obliteration of the lumen. The base of the appendix is the thickest portion of the organ; it is thrown into folds and in one place shows a perforation. The tissue filling the lumen of the appendix and extending about the perforation is finely granular and hæmorrhagic, but has not the distinct architecture of an adenocarcinoma. It suggests the picture of the so-called diverticulum of the appendix, in which the hypertrophied mucous membrane and glands follow the perforation, ramify through the chronic granulation tissue — chronic diverticulitis.

MICROSCOPIC SECTIONS

Section 1. From the base of the appendix in which the wall is distinctly preserved. The section shows a thickened wall with lymphoid areas, increased vascu-

[1] I. C. Herb. Diverticulum of the Vermiform Appendix. Jour. Am. Med. Assn., Chicago, 1907, v. 48, No. 25, pp. 2145–2147.

[1] Presented at the Richmond meeting of the American Surgical Association, May, 1908.

larity beneath the peritoneum, with replacement of muscle by chronic inflammatory tissue. The mucous membrane is thrown into folds; in places the glands are slightly hypertrophied; there is an increase of the lymphoid tissue in the mucosa; in places this lymphoid tissue perforates the mucous membrane and extends to the surface. The epithelium lining the glands is everywhere intact; the normal architecture is preserved. In the stroma between the glands there is an excess of lymphoid cells.

Section 2. From the body of the appendix at some distance from the enlarged cæcal end. This resembles section 1, except the submucosa lymphoid hypertrophy is less marked.

Section 3. From the perforation or diverticulum. This tissue is composed of mixed lymphoid and fibrous tissue; we can trace the mucous membrane in the lumen of the appendix dipping down and lining the diverticulum. As the mucous membrane dips down, it is associated with hypertrophy of the glands; beneath the glands there are large areas of lymphoid tissue which in places grow up, break through the mucous membrane, and extend to the lumen. In these places the glands show atrophy, with complete disappearance of some areas. In every gland the morphology and arrangement of the basal cells is preserved; there is no atypical growth and no downgrowth of these glands into the mucosa.

Section 4. Similar to section 3. This section shows chiefly the mucous membrane lining the lumen of the appendix, with the thickened wall of the appendix beneath. In the connective tissue beneath the lumen the section passes through the diverticulum and is lined with mucous membrane.

There is no evidence, therefore, of adenocarcinoma, but it can be looked upon as a beautiful example of diverticulum of the appendix.

NON-PARASITIC CYSTS OF THE SPLEEN[1]

Report of a Case

By GEORGE BEN JOHNSTON, M. D., Richmond, Virginia
Professor of Abdominal Surgery in the Medical College of Virginia

THREE kinds of cysts have been found in the spleen: 1. Echinococcus cysts; 2. Non-parasitic cysts, serous cysts, blood cysts, and lymph cysts; and 3. Dermoid cysts.

Echinococcus cysts, while the most common, occur only in those countries where hydatid disease prevails, and the spleen is rarely the only organ involved.

There is only one recorded instance of dermoid cyst of the spleen. This was reported by Andral in 1829, and was said to contain fatty matter like tallow, with hairs scattered throughout.

Non-parasitic cysts of the spleen are unilocular or multilocular in character, and contain either serous fluid, blood, or inspissated granular material. They are probably always hæmorrhagic in origin, the most common cause being a partial rupture of the spleen following trauma or occuring in the course of some acute infectious disease, such as typhoid fever. Cysts of long standing usually show a distinct thick capsule, but it is questionable whether all of the reported cases should be classified as cysts because in some of them the condition, as described, appears to be simply a subcapsular hæmatoma.

Non-parasitic cysts of the spleen are uncommon. In a paper read before this association in 1905, Powers (1) collected 32 cases, including one of his own. In the same year, Bryan (2) reported a case before the American Medical Association and collected 35 cases from the literature. In a recent paper (3) on the subject of splenectomy which I read before the Johns Hopkins Medical Society, I was able to collect, up to January, 1908, 19 cases in which the spleen was extirpated for non-parasitic cysts. At the last meeting of this association, Huntington (4) presented a case which he treated by marsupialization, and I have found one other recent case which was discovered at autopsy and reported by Harnett (5). A reference to these papers will furnish a complete bibliography on this subject. In this communication I simply desire to place one more case on record, together with a most complete pathological report

[1] Presented at the Richmond meeting of the American Surgical Association, May 6, 1908.

of the specimen by Dr. William H. Welch, of the Johns Hopkins Hospital, Baltimore.

The patient was a woman, 46 years old, who had always lived in a malarial district, and who gave a history of several attacks of chills and fever. There was no history of severe trauma, by which the spleen may have been injured, nor could we elicit a definite history of typhoid fever. The patient complained of pain in the lower left abdomen. Examination showed a large myomatous uterus, but in addition a superficially placed mass in the region of the left kidney. This was about the size of a fist, rather freely movable, and slightly tender on pressure. Blood examination showed 6,400 leucocytes, with polymorphonuclear neutrophiles 52.5 per cent, small mononuclears 42 per cent, large mononuclears and transitionals 3.5 per cent, and eosinophiles 2 per cent. The urine was negative. It was determined to do a hysterectomy for fibroids and at the same time, to make an exploration of the mass in the left side. Seven years prior to this, an operation was performed by Dr. Howard Kelly, of Baltimore, for suspension of the uterus.

Operation was done in April, 1907. This disclosed an ectopic spleen lying just above the left iliac fossa. This organ could be easily delivered through the median incision. On its concave surface, near the hilum, there was a prominent bulging mass about the size of a goose egg, perfectly white in color, and of a hard, rather brittle, consistency. The advisability of splenectomy was considered, but this was not done because the spleen appeared normal in every respect, except for this mass and its increased mobility, and because it was found that the cyst could be quite easily shelled out by blunt dissection. This was accordingly done, leaving a raw bleeding surface which was easily closed, however, by catgut sutures threaded on blunt liver needles. The repaired spleen was then replaced in approximately its normal position, but no attempt was made to secure it in place. The myomatous uterus was also removed. Recovery was without incident, and at the time of the patient's discharge the spleen could not be felt on palpation. I am much indebted to Dr. Welch for the following complete pathological report.

GROSS PATHOLOGY

The specimen, preserved in alcohol, is an egg-shaped tumor attached to a thin piece of the spleen removed with the tumor. The tumor is 9 cm. long; at the broader, lower or free pole 7 cm. in diameter and at the smaller, upper or attached pole 4 cm. in diameter. This latter pole over a nearly circular area, 4 cm. in diameter, is intimately adherent to the membrane-like plate of splenic tissue, about 0.5 mm. in thickness, which was removed with the tumor and which is intimately incorporated with the wall of the tumor and cannot be separated from it. This attached piece of spleen projects for a few millimetres free along its severed margin as a delicate, thin membrane. With the exception of the attachment to the spleen, the external surface of the tumor appears to be free from any evidences of adhesions, nor can blood-vessels be distinctly made out with the naked eye in the outer wall of the tumor, except a few small veins. This outer surface of the tumor is white or grayish white, and smooth, save for slight irregularities or projections due to the extensive calcification of the wall.

Upon incision, the tumor is found to be a single cyst with a thin wall not exceeding 0.5 to 1 millimetre in thickness, except where attached to the spleen, the wall here being 2 to 2.5 mm. in thickness. The wall is rendered hard by extensive calcification, so that in places, especially at the lower pole, it is bony in consistence.

The sac of the tumor contains no fluid but is filled with a solid material of a friable, grumous consistence in the central and greater part of the cavity, but smoother, more coherent, and of elastic consistence near the wall of the cyst. The contents can be readily separated from the cyst wall, although somewhat adherent to it. Upon crushing the contents between the fingers, there is more or less of a gritty consistence, but the prevailing consistence is rather soft and greasy. There is no such diffuse and extensive calcification of the contents as of the wall of the cyst.

The color of the material filling the cyst is dirty whitish, with a brownish tint, this latter tint being most marked in the periphery near the wall, where the color is yellowish brown, suggestive of altered blood pigment. In the central mass the color is little suggestive of altered blood. The contents of the cyst to the naked eye, therefore, appear to consist of debris of necrotic material, with some altered blood, and fine particles of lime-salts.

MICROSCOPICAL EXAMINATION

Teased bits of the material within the sac show abundant crystals of cholesterine, fatty globules of small size, some myeline droplets, spherical, refractive bodies somewhat larger than leucocytes, and indeterminate granular and hyaline material. Intact cells or tissue cannot be recognized.

Microscopical sections through the wall and adjacent contents of the cyst, made after decalcification, show the wall to be composed of dense, laminated, fibrous tissue containing long, fusiform cells. In many places these cells are absent, the tissue being hyaline and necrotic. The calcification occurs throughout the wall in places, and is often continuous on the inner surface, which is not sharply defined, but consists of necrotic tissue, much infiltrated with blood, and continuous with the usually better preserved tissue in the outer layers.

In the sections the contents of the cyst appear for the most part as a structureless, granular, and homogeneous material, rich in cholesterine, and devoid of intact cells, but near the cyst wall there are, in places, indications of a coarsely-meshed trabecular, connective tissue, necrotic, but containing in the meshes red corpuscles, fibrin, lymphoid cells, and larger blood-corpuscle-containing cells. This tissue is suggestive of splenic tissue, and appears at the lower pole, as well as in other parts of the cyst.

Sections were made to determine, if possible, the precise relations of the tumor to the spleen. The capsule of the spleen is continuous with the wall of the cyst. Where the wall of the cyst comes first into contact with the splenic capsule, this capsule bends down into the cyst wall. There is, however, a thick band of connective tissue separating the parenchyma of the spleen from the contents of the cyst and constituting in this situation the wall of the cyst. This connective tissue merges into necrotic and hyaline tissue, containing in slits and spaces red corpuscles, lymphoid cells, larger granular cells, and fibrillated fibrin, forming eventually debris in the interior of the cyst.

DIAGNOSIS

The tumor is most plausibly interpreted as the result of an extravasation of blood of old date and associated with necrosis of tissue. There is no evidence of a genuine neoplasm. The source of the hæmorrhage appears to have been the spleen, and its seat primarily beneath the capsule of the spleen which, as described, constitutes the wall of the cyst either wholly or in part. It is possible that the hæmorrhage is associated with an infarction, and that the contents of the cyst consist not only of extravasated and altered blood, but also of necrotic splenic tissue resulting from infarction, but positive evidence of such infarction is no longer present, and it may be that the condition was merely a hæmatoma distending the capsule of the spleen, and perhaps rupturing it.

The question as to whether the tumor is due to primary rupture of the spleen, with hæmorrhage into the peritoneal cavity, or to a subcapsular hæmatoma of the spleen, it is difficult to answer positively from the existing microscopical appearances, but it is difficult to understand how such a non-adherent encapsulated cyst could be produced as the result of rupture of the spleen. I am, therefore, of the opinion that the tumor is the result of an intrasplenic hæmorrhage or hæmatoma, causing a protrusion over a circumscribed area of the capsule of the spleen. Changes have occurred in the blood and other contents of the tumor, which indicate that the original lesion is of old date.

REFERENCES

1. C. A. Powers. Non-Parasitic Cysts of the Spleen. Ann. Surg., Phila., 1906, vol. xliii, No. 1, pp. 48–60.
2. W. A. Bryan. Cysts of the Spleen. Jour. Am. Med. Assoc., Chicago, 1905, vol. xlv, No. 10, pp. 680–684.
3. G. B. Johnston. Splenectomy, with a Report of Six Cases, etc., to appear in Ann. Surg., Phila.
4. T. W. Huntington. Report of a Case of Non-Parasitic Cyst of the Spleen. Surg., Gynec., and Obs., Chicago, 1907, vol. v, No. 1, pp. 31–33.
5. W. L. Harnett. A Case of Hæmorrhagic Cyst of the Spleen. Lancet, Lond., 1907, vol. clxxii, No. 3, pp. 148–150.

SOME OF THE DEBTS WHICH MEDICAL SCIENCE OWES TO SURGERY

The President's Address before the American Surgical Association

By WILLIAM H. CARMALT, M. D., New Haven, Connecticut

WOULD it not be well for the Association to have a rule, that the committee on the nominations for officers should consult with the council, before making their nominations, and thereby have the Association avoid the anachronism of electing for its president a Fellow who, at the same meeting, is laid upon the shelf by the council? Is one, labeled by the council as of the "sere and yellow leaf," the proper one to represent an association of the most progressive surgeons in America? Is the "lean and slippered pantaloon" of the poet to address, as it were with authority, those "eager for the fray?" Hence, while I can but appreciate in the highest degree this the crowning honor of a quiet and uneventful surgical life, I feel most keenly that there are many of my audience more deserving of recognition for work done and results achieved; and who would do greater justice to the duty which the position exacts.

It is now a few months beyond the half-century since the speaker began the study of medicine; and, although the subject is trite, it is impossible for one who has continued for that length of time to practice, and for three-fifths thereof to teach surgery, not to reflect upon the differences and the amazing progress that has been made, not only in the art, but in the science of surgery — for it has become such now more than ever before.

At that time specialism was regarded with disfavor; those who allowed themselves to be, or were so designated, were thought of as approaching dangerously near to quackery; — were looked upon askance. Although the term is allowed now to be used without reproach, and many and great advances are recognized as being made by the devotion of individuals to a particular line of study, nevertheless we are continually meeting with baneful effects from specialism, in the narrowing of the horizon of those who confine themselves to a single line of practice, and to feel that it oftentimes runs rampant, to the border of licentiousness. Indeed, the laity follow the lead to such an extent that frequently most absurd, even dangerous, practices are indulged in by persons otherwise intelligent, as an instance I have recently known shows, and most of you have undoubtedly known of even worse, where a gentleman of great learning, under the care of his family physician for months for positive but somewhat obscure renal disease, without informing this physician that there was anything at fault with his vision, also consulted an ophthalmologist for his ocular symptoms, not telling him either, that his kidneys were under suspicion. The ocular symptoms were, also, not clear, and these two physicians went on for some weeks investigating this patient simultaneouly, neither knowing what the other was doing, or that there were at the same time both ocular and renal complications; each in itself obscure, but taken together capable of explanation and understanding.

It was in order to emphasize the interdependence of the different specialties that, with the initiation in this Association by our honored colleague, the late Dr. Claudius H. Mastin, the preliminary steps were taken for the formation of the Congress of American Physicians and Surgeons, which has been so conspicuously the means of bringing together, every three years, most of the principal special associations of the country, for the purpose, as it states, of presenting and discussing "scientific subjects selected with reference to their general interest." The evidence appears clear that the object for which the Congress was inaugurated has been largely attained.

In our own Association the tone is distinctly that the operative part, per se, is regarded from a much higher point of view and the field correspondingly widened. While perfection of technique is, as it *must* be, regarded as of absolute necessity, the objects sought in every operation, viz., the life or improvement in health of the individual, and the increase in surgical knowledge, are more and more emphasized, so that we now consider percentages of results instead of reports of individual cases; — we speak of the contributions of surgery to the elucidation or consideration of a particular disease; — the end-results of some particular line of surgical procedure. Last year's symposium was on the "End-results following operations for carcinoma of the breast." One of the topics considered at the Congress of last year was: "A consideration of the end-results in benign lesions of the stomach, surgically treated." Again, "The contributions of surgery to a better understanding of gastric and duodenal ulcer;" this afternoon we are to discuss still further one of the above subjects, i. e., "Late results after operations for benign diseases of the stomach and duodenum;" all of which shows that the trend of thought recognizes the underlying principle always to be borne in mind, but too often ignored, that a surgical operation is to be looked upon as an incident in the course of treatment, which has become a necessity because other means have failed; and one may assert, with perfect fairness, that a surgical operation, per se, is a confession of failure. A failure because some other, less mutilating, procedure has not sufficed for cure. We wouldn't amputate breasts, if we could cure them with condurango or X-rays; we wouldn't do gastro-enterostomies, if the stenosis of the pylorus could be as satisfactorily relieved otherwise; and so on, ad infinitum; and the judgment and acumen of

the surgeon is now prized, not only for the technical skill, invaluable as it is, but still higher for that knowledge which guides to the decision of when to operate, if from necessity an operation must be, and when to let alone.

A glance over the titles to the papers on the present program, shows this tendency to generalization, to establish principles rather than particular procedures; and it has been a long time since I have heard the expression used by a surgeon that the operation was successful, but the patient died. No operation is successful, if the patient dies. No matter from what cause he dies. If he dies from shock, we do not correctly estimate his powers of resistance, or omitted, or did not properly apply a remedy; if the anæsthetic kills him, there is an error in judgment for which we are responsible, and the operation is not a success. If the ether develops an acute nephritis, we have failed; if it causes a pneumonia, there has been an error in an important technique; and if we can expect to advance our science, we should make honest acknowledgment.

This broadening of our field carries with it, of necessity, the study of the processses of disease, the surgeon becomes the pathologist and the physiologist; in times past he has always been the advanced thinker, and beyond all the experimenter and demonstrator: witness William Harvey and John Hunter, both surgeons; witness in our own time the great founder of this Association, writing in 1835, the first treatise in the English language on Pathological Anatomy; witness, in 1855, Sir James Paget's Surgical Pathology, and later, in the same decade, Billoth's Surgical Pathology, both of which, however, by their breadth of thought and comprehensiveness of detail of vastly more than surgical significance.

I am tempted, in this connection, to quote from an address by Professor Hans Chiari, delivered at the seventy-second meeting of German Naturalists and Physicians, in 1900, on "Pathological anatomy of the nineteenth century and its influence upon external medicine," in which he says: "The surgeon and the practitioner of individual specialties of external medicine made the greatest progress in the diagnosis of disease by knowledge of pathological anatomy, especially in infectious diseases whose excitor was more frequently recognized; also in tumors and in numberless other diseases. The distribution and course of diseased processes was investigated further, so that prognosis became more definite, and the indications for therapeutic attack more accurate; the processes of repair and regeneration were cleared up; and, thanks to the simultaneous development of antiseptic and aseptic technique, the boundaries of operative surgery became enlarged to a previously unimagined extent. But the 'Externist' held not only a receptive position in relation to the pathological anatomist, but pursued pathological studies himself with great eagerness, rivaling therein the more distinctive pathologist; especially so the surgeon in the domain of tumors and bone diseases. In certain especial fields of external medicine . . . . the clinician was indeed the pathological anatomist of that particular part. It is an interesting circumstance that many clinicians in external diseases, as well at internists, took up their especial line of work after having served as pathological anatomists; thereby each, according to his understanding, laid out a valuable foundation for his later clinical activity. It is, therefore, quite clear how that surgery, during the nineteenth century, has been advanced by the great strides in pathological anatomy during the same period, and it is to be hoped that in the future the mutual advances of pathological anatomy and practical medicine will celebrate still further triumphs to the benefit of mankind."

While the advances in surgery, speaking in the narrower sense, have been so immense in almost every line that to attempt to enumerate, let alone describe them, would occupy many times over the time at our disposal, besides being an already twice-told tale in nearly every direction, I have thought it well to refer briefly to some of the situations where surgery in the immediate past has demonstrated its claim to have advanced knowledge in general medicine; to reverse, indeed, Professor Chiari's view of the relation of surgery to pathological anatomy and show that modern surgery has been the means to develop our knowledge in pathological anatomy. To mention, or charge up, some of the debts which scientific medicine owes to surgery:

If any Fellow of the Association has not yet

read Dr. T. Clifford Allbutt's address on the "Historical Relations of Medicine and Surgery," delivered at the St. Louis congress in 1904, he should do so, for not only will he have the pleasure of reading a most delightfully written discourse, but he will leave the perusal with a much higher sense of the position which surgery holds in the process of the development of the science of medicine, than is usually given it; and if he will, in conjunction therewith, read the "Annals of the Barber-Surgeons of London," he will find how much more scientific the surgeons were in their methods of advancement in their art, than the physicians of that day, who, while regarding surgeons as of inferior professional rank, were nevertheless bound to the relics of tradition, and lost in the obscurities of vague speculation, until instructed in anatomy by the surgeons. We read how "in the early part of the reign of Edward II. . . . the barbers having been accustomed to assist the *monks* in the surgical operations performed by them in early times, acquired a degree of proficiency which enabled them to practice as surgeons themselves. Up till about the twelfth century, the practice of surgery and medicine was, however, almost wholly confined to the clergy, who seem to have enjoyed the double privilege of curing men's bodies, as well as their souls. In 1163, the Council of Tours, under Pope Alexander III, considering that a practice which involved in its operations the shedding of (human) blood, was incompatible with the holy office of the clergy, forbade them to interfere in any matter of surgery. . . . No doubt the Edict of Tours was hailed with joy by the barbers, who, thus, found a lucrative practice thrown in their way, and seized the opportunity of practising as surgeons 'on their own account,' calling themselves barber-surgeons, and practising both barbery and surgery;" and those annals show the gradual development of the art, from the assistant to the monk to the independent and self-reliant surgeon, in that he prepared himself by the study of anatomy; making surreptitious dissections on human bodies, and experiments on living animals; demanding, for his own protection, the passing of examinations; and obtaining licenses to practise, until they made themselves known as the advanced investigators and astute thinkers of the two branches of the healing art of medicine. But the subject is too fascinating and will lead too far-a-field to allow it to be pursued further. I must refer you to the annals themselves and return to the order of the day.

Surgery has, however, come to the fore in showing the great advances in medical science during the lives of some of us. Many remember, undoubtedly, Sir James Simpson's memorable paper on Hospitalism, wherein the mortality in surgical operations between hospitals and private practice was emphasized to the disadvantage of the former; arguing strenuously against hospitals as being unsafe places in which to practice surgery. To-day, we all know that the best results of surgery are obtained in properly appointed hospitals; that they are sought for and utilized by all classes, the well-to-do, the millionaire, as well as the pauper; though it is but a few years since the distinguished president of the Massachusetts State Board of Health, Dr. Henry P. Walcott, remonstrated to me against the elaborateness and expense of our hospital appointments (appliances), on the ground that we were giving to the pauper and the degenerate an unfair advantage over the great mass of the moderately well-to-do, in the struggle against disease.

How, then, has this change been brought about? By two discoveries — anæsthesia and asepsis; neither alone accomplished it. Sir James's paper was written some years after anæsthesia had robbed surgical operations of their extreme horrors. We could then promise our patients that they would not suffer; but, alas! could not speak with confidence of recoveries. The mortality following surgical operations in hospitals was frightful — pyæmia, septicæmia, hospital gangrene, erysipelas, veritably raged. Let me recall what some of you, perhaps, heard, Professor Richard Volkmann's eloquent address before the International Medical Congress in London, in 1881, where, describing the advances in surgery for the ten years preceding, he spoke of the mortality so prevalent before the Listerian period; and asserted in contrast to the previous 85 per cent of fatalities following major operations, from infectious wound fevers in his hospital at Halle, that if now a single patient dies in

my wards, from such causes, "it is my fault." We recognize that situation now, and so secure do we feel in our technique that we advise our patients to submit to early operations, saying first, you will not suffer pain; second, you will, in all reasonableness, recover from the operation. With these assurances faithfully and conscientiously given, we can advise early operations, and operations for explorative purposes, that twenty-five years ago would have been unjustifiable; not waiting to operate as then, as a last resort, but for distinctly therapeutic purposes; to counteract vicious *tendencies* that were leading to fatal consequences. Thereby are we enabled to study disease in its early stages, and instead of, as heretofore, considering surgical operations as almost necessarily radical and mutilating procedures, many of them are in the highest degree conservative. While one cannot regard the removal of a breast as otherwise than radical, it is, also, of course, intended to be curative; but a gastroenterostomy for benign stenosis of the pylorus, or other obstruction in the upper intestinal tract, is at once therapeutic and conservative, it reestablishes a function that was being interfered with.

It is, at times, difficult to say to which, surgeon or pathologist, credit is due when referring to the advances in the surgical pathology of the present time. Gross, Paget, and Billroth were all conspicuously able operating surgeons, but searching, always, beyond the mere surgical technique for the causes of disease. No one, except Virchow, has done more than these surgeons to stimulate investigations into, or themselves to teach, fundamental pathological processes.

Prompted by the researches of Pasteur, a chemist, Lister, another surgeon, becoming convinced that the cause of putrefaction in wounds was due to the entrance therein of germs, pursued his investigations to counteract their effects, until he and his followers developed the incalculable benefits of antisepsis and asepsis in surgical operations; causing a transformation, amounting to a revolution, in the respective positions of medicine and surgery. From being ostensibly a follower, surgery took the lead in determining pathological processes, from the pathological anatomist reporting the conditions found on the post-mortem table, and studying the last fatal, more or less complicated stages of disease, where cause and effect are often so inextricably mingled, autopsies *in vivo* are established and the beginnings of pathological processes are unfolded fresh in the living subject. In neoplasmata, the nature may be determined with certainty, while the patient lies unconscious on the operating table, and the fitting operation, based upon the examination thus made, be carried out, with a surety for the ultimate result that elevates our art to a science.

In no one disease is the change in the relation of physician and surgeon more striking than in tuberculosis. Thanks to Koch, by his laboratory researches establishing its microbic origin, this disease, formerly regarded as belonging solely to the internist, to be treated only by drugs and constitutional remedies, its initial local character is proven and in many, if not most, of its forms, opportunity presents itself for surgical interference in its early stages, with a definite prospect of eradicating the disease. The operations are distinctly therapeutical in aim and scope; for surgery has taught that generalization takes place from a primary focus to be attacked surgically. In every text-book of modern surgery, the catalogue of organs and tissues affected by tuberculosis, to be attacked by surgical procedures, with reasonable prospects of success, is limited simply by anatomical considerations of accessibility, and by early recognition — though by surgical procedures one does not necessarily mean a bloody operation. Immobilization is as much a surgical procedure as resection, and the interdependence of internal and external medicine is exemplified in the treatment of this disease. I venture the prediction that with the development of X-ray skiagraphs, or other technique for diagnostic purposes, surgery in the lives, and perhaps under the skillful hands, of some of my hearers will be the means of treating early pulmonary tuberculosis, with even more certainty, and with a greater saving of life and time than the internist is now doing with the most approved sanitaria. Think of the change with regard to tuberculous peritonitis, now so frequently amenable to treatment distinctly

surgical when the infectious atrium is recognized and removed.

Our knowledge of the internal secretions, and particularly of those of the thyroid and parathyroid glands, has been materially, almost exclusively, advanced by the observations and investigations of surgeons; and the names of several of the active Fellows of this Association are intimately associated with the development of this intricate subject. The program of the present meeting is pregnant with interest. The first impulse to the study of the condition which he subsequently designated as cachæxia strumipriva was made by our honored Fellow, Professor Kocher, in noticing the later results of total extirpation of the thyroid gland when undertaken for cosmetic reasons or pressure symptoms. He remarked upon the identity of the condition thus produced with that so well known in places where goitre was prevalent, of cretanism, myxœdema, etc., and found, first, that these conditions were the consequences of total extirpation of the thyroid; while, second, if but a partial even though considerable removal were performed, the condition did not pertain. This led, naturally, to the opinion that there was a something, elaborated by the gland, which, being taken directly into the blood by its own vascular apparatus, could be regarded and designated as an internal secretion, and, further, that the deprivation of this secretion gave rise to the pathological conditions mentioned; while, if but a small part of the gland was allowed to perform its function, this result did not pertain.

Differences between goitres were noticed early; some were accompanied by symptoms of quite a different character than those mentioned, of which an exophthalmos was the most striking characteristic, and exophthalmic goitre was described by Graves, in 1835, as a distinct entity. It remained for surgery, however, to demonstrate that the conditions present in Graves' disease were due to an excess of the thyroid secretion, and this excess amounting to a poison produced the recognized symptoms of exophthalmic goitre, to which the names of thyrotoxæmia or thyrotoxicosis may be given. Further observation by surgeons, showed differences in the behavior of the two classes of cases towards operative interference; that while those unattended by exophthalmos would, under proper precaution, be benefitted by operation, in Graves' disease operative interference was attended with great danger; which, while in the hands of the exceptionally dexterous and rapid operator, might be successful, too often led to disastrous consequences on the operating table, or immediately after, due apparently to forcing suddenly into the circulation an undue amount of the secretion, already too abundant, of the hypertrophic gland.

Again, a certain number of the operated cases developed a tetany more or less severe, not infrequently fatal, especially in those in which the total extirpation of the thyroid gland was practised, but not so often or not so severe in those in which a portion of the gland was left.

In 1882, Sandstrom discovered and described the little parathyroid glands lying in the fat surrounding the posterior portion of the thyroid gland. They were differentiated by structure and situation from accessory thyroids, and little by little surgical observations and experiences, controlled and confirmed by experimentation on the lower animals, appeared to show that removal, or the obliteration of the blood supply, of the parathyroids was the determining cause of the tetany following operations presumably or ostensibly only on the thyroid gland; that their removal, or the retention (whatever it may be) in the blood, as demonstrated when the parathyroid arteries are tied off intentionally, or cut off inadvertently in removing the thyroid, induces a hypoparathyreosis or status parathyreoprivus (Halsted) of which the characteristic symptom is tetany, more or less pronounced, occasionally fatal. This, an entirely new discovery, was brought about by the careful observations and close reasoning of surgeons of the John Hunter type; and the work of William S. Halsted, Charles H. Mayo, George Crile and Harvey Cushing, active members of this Association, together with those of Theodore Kocher and Victor Horsley, honorary Fellows, will always be recognized in this connection. The physiologist and pathologist must acknowledge that they owe the most of their knowledge of the causation of tetany to the labors and intellectual acumen of surgeons. The normal histology

of these bodies seems to be fairly well described, but many details of their physiology and pathological anatomy are still open fields for investigation, and while it is unsafe to prophesy, "onless ye know," it is certainly not a far-fetched thought to anticipate, that the pathogeny of many of the clinical forms of tetany, now classed under the most diverse heads, with all sorts of hypotheses as to their causation, may resolve themselves into abnormalities or diseased processes in these glandulæ or their vascular supply.

The etiological relationship between inflammations of the pancreas and the biliary apparatus, is a field in which recent surgery has taught the pathologist and clinician much of value. Until the surgeon by early operations had shown the beginnings of the secondary processes, the bearing of infections of the gall-bladder and ducts to pancreatitis was unknown; indeed, almost the whole domain of the infections of the biliary passages was a terra incognita until the surgeon blazed a trail for the pathologist.

It gives me pleasure to recall here, also, the paper read to this Association last year on "Diverticulitis of the Large Intestine," which marked a distinct increase in our knowledge of the pathological anatomy of the sigmoid; necessarily carrying with it a great deal better understanding of the means to combat the disease, together with an infinitely more accurate prognosis.

With this meager presentation of a few of the instances in recent years, and conspicuously by this Association, where general medicine is indebted to surgical progress, I beg a few minutes more to urge the claims of surgery to greater facilities for study along these lines. Probably every member of this body holds a hospital appointment, and there are probably but few who do not feel, almost daily, the inadequacy of the facilities at their command thoroughly to investigate, by laboratory methods, the pathological processes with which they have to do. Most of us are handicapped in this particular. Every hospital should have its pathological department fully equipped with every laboratory facility, for the investigation and demonstration of diseased processes. So much has been said recently on this matter that little more can be added; but it has been borne in upon me most profoundly from a comparatively long hospital experience, that this is at present the greatest shortcoming in our hospital equipment. One has but to look over the work emanating from the various hospitals throughout the country to realize that those having the most complete laboratory facilities are those from which the most instructive and advanced ideas come and, I may say, the best results in practice.

Hospital directors or trustees, find it difficult to appreciate this feature of hospital management; most of them regard anything that does not directly (according to *their* light) concern the immediate welfare of the individual patient, to be an unnecessary expense, a waste of trust funds. In their sympathy for the individual sufferer, they lose sight of the benefit to the community, which comes from increase in knowledge. They have been forced to understand the advantage, necessity rather, of an aseptic operating room, and spend large sums in making it complete — it looks well; it impresses the public; astounding operations are sucessfully performed, it *is* good, — but the laboratory does not appeal in the same way or to the same sense. The work is hidden, mysterious, there is no striking or evident result, or the result is too remote to be understood; "it is a fad, has no practical utility," etc. It is to them something of a confession that the attending staff don't know as much as they should. They say, you hold your position to cure the sick, not to investigate; they forget that medical science is and must be, to the end of time, progressive. Then, again, laboratories *are* expensive; they mean salaries, instead of the voluntary service the trustees are too apt to expect, and indeed, demand, from their attending staff; they mean costly apparatus; they mean running expenses by no means light; yet, with it all, they are worth the cost many times over — they are essential to every up-to-date hospital, giving the proper stimulus to the attending staff in the completion of their work. The joy of knowledge that comes to the scientific surgeon who has the opportunity to study the details of the pathologcal process with which he has been dealing, and to have demonstrated, at first hand as it

were, the reason for success or non-success; the knowledge from which comes the power to overcome obstacles while they are, alas, not often recognizable factors to the usual trustee, are nevertheless the compensation the staff are seeking.

From a strictly economic standpoint, the union of medical school, with its necessary laboratory equipment, and hospital, would seem to work to the best advantage. The educational function of a hospital is then recognized, and the best results secured. The presence of a class of medical students is the best possible stimulus to the mental activity of an attending physician or surgeon, who is compelled to discuss the pros and cons of an intricate case with them; active in mind, fresh from their books and laboratories; critical of authorities; eager for knowledge; comparing clinical symptoms with laboratory findings in which they themselves have, perhaps, participated, their presence is an inspiration which inevitably redounds to the benefiit of the patient and the hospital.

In this matter of the highest utilization of a hospital it has seemed to me, further, that it would be possibe to elaborate a plan by which all senior students in small classes in relays could be given clinical instruction, on individual cases, in any hospital accessible; the attending staff becoming in fact and name clinical professors in a recognized medical school. The plans would have to vary in different localities, but it does not appear to me an impossible scheme, and, if carried out faithfully, would add greatly to the interest of the work everywhere and surely be of benefit to the hospital in spurring men up to work now too often perfunctory.

In presenting these desultory reflections upon matters that have suggested themselves to me, as illustrating some of the contributions to the science of medicine that have been brought about, in recent years, mainly through surgical procedures, I beg to reiterate my appreciation of the high honor you have accorded me, in selecting me to preside over your deliberations, the program of which presents topics of very great interest to surgical advancement.

CONGENITAL IDIOPATHIC DILATATION OF THE COLON

(Hirschsprung's Disease)

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THE subject of this paper is a boy aged nine years; of Jewish parentage. He was admitted to the Union Protestant Infirmary, April 26, 1906, referred to me by Dr. Frank R. Smith. He came into the hospital complaining of chronic constipation, and abdominal pain and swelling. His family history was negative, there being no record of any similar case, so far as is known.

Previous history was of no special interest, except as relates to his present illness. He had had measles and chicken-pox, and, aside from the fact that he had always been thin, and his appetite fairly good, no other information could be elicited. His mother stated that from his earliest infancy, beginning immediately after birth, he had always been constipated, and that the abdomen had been unusually large. His bowels have never moved normally, always necessitating a cathartic or enema, or both. He would frequently go three or four weeks without a movement. During these times he would have periods of severe abdominal pain, cramp-like in character. After the bowels began to move, the pain would be relieved. He would have several attacks of this extreme constipation during the year, and great difficulty would then be experienced in producing a movement. At these times the abdomen would become enormously swollen. Under ordinary circumstances, he would have a movement once or twice a week, and the abdomen would be somewhat less distended. The stools were putty-like in character, and the odor very offensive. He has had all sorts of treatment from many doctors, but relief has been only temporary.

Upon examination, the patient is found to be a boy rather undersized; mucous membranes pale; tongue clean. General expression not very bright. The whole body, except the abdomen, thin and emaciated. Ribs very prominent. The costal angle very wide. Chest much larger at the base than apex, the costal margins flaring out to such an extent that they are almost horizontal instead of vertical. Movements of the chest rather limited. Lungs clear on auscultation, but the pleural cavity somewhat encroached upon by the push-

ing up of the diaphragm, due to the abdominal distension.

Heart normal in size, apex slightly higher. Heart sounds clear.

Abdomen very full and prominent, the over-lying skin dull and leathery in appearance, and somewhat tense. Superficial abdominal veins quite prominent. Circumference of chest through the plane of the nipples, 54 cm.; of abdomen over the most prominent part which was at the epigastrium, 65 cm., through the plane of the anterior superior spine, 54 cm. Distance from umbilicus to symphysis 13 cm., to tip of xyphoid 17 cm. Liver dullness considerably diminished. The distension of the abdomen is not quite symmetrical, there is to be seen a crescentic enlargement extending from the left iliac fossa upwards to the costal margin, then across the abdomen to the right hypochondriac region, where it gradually disappears The right iliac region is slightly less distended than the rest of the abdomen. At times, very marked peristaltic waves can be seen traversing the abdomen. The wave seems to travel from right to left, about once in five minutes. The patient complains of no pain during the contraction. On palpation, no tenderness and no masses are to be felt anywhere. The abdominal walls seem unusually thin. The intestinal coils may be felt very distinctly during the passage of the peristaltic wave. No movable dullness was observed. Now and then loud borborygmi could be heard.

Rectal examination was negative. Attempts were made for a fortnight to reduce the abdominal swelling by the aid of frequent enemata and cathartics, with only partial success. Large quantities of fœcal matter were removed in this way.

It was determined then to make an exploratory incision and perform a colostomy. Consequently, on May 10th, under ether anæsthesia, the abdomen was opened. An enormous dilatation of the colon was found filling up practically the whole abdomen, with the exception of the right iliac fossa. The dilatation began abruptly at the hepatic flexure of the colon, involving the transverse and descending portions of the colon and the entire sigmoid, with the exception of the last two or three inches, where it as abruptly ended. The rest of the intestinal tract, including the rectum, was normal. The greatest dilatation was in the region of the sigmoid, in places 14 cm. in diameter. The walls of the bowel were much hypertrophied, apparently two or three times the normal thickness. Pigmentation of the hypertrophied portion was also observed. The mesosigmoid was elongated and enormously thickened, in places as much as 2 to 3 cm. The vessels were much larger than normal, as were also the lymphatic structures, especially the lymphatic glands, some of which were as large as almonds. The hypertrophy of the intestine began and ended abruptly, with no signs of kinking or obstruction of any sort. A portion of the thickened mesentery, including one of the enlarged glands, was removed for examination. The intestine was filled with fæcal matter and gas. It was decided to perform a colostomy and the colon at the hepatic flexure was sutured to the parietal peritoneum, through a small incision made over that point. The abdominal wound was then closed. After forty-eight hours the colon was opened and the bowels irrigated through this fistula from above downwards, and through the anus, from below upwards. Large quantities of yellowish, pasty fæces, containing many pin-worms, were removed. A small section of large rubber drainage tube was inserted into the fistulous opening in order to insure its patency. This artificial anus was kept open for nearly six months, during which time the patient remained in the hospital, and the bowel was frequently irrigated.

Great improvement in the boy's general condition was observed. He gained weight and strength, and the swelling of the abdomen was markedly reduced. Most of the fæcal matter was discharged through the fistula, but some continued to accumulate in the dilated portion of the colon. It was then decided to attempt to short circuit the dilated portion of the colon, or to excise it, as seemed best at the time. Accordingly, on October 23d, under ether, the abdomen was opened through a mid-line incision. It was then found that the dilated portion of the colon, described above, had become greatly reduced in size since the establishment of the fæcal fistula. The mesocolon and the glands had also shared in this reduction. Since there was found to be room to make an anastomosis between the ascending portion of the colon and the lower portion of the sigmoid flexure, it was decided to do this. It was accomplished by a lateral anastomosis. The colocolostomy having been completed satisfactorily, it was decided, on account of the patient's condition, that it would be safer to postpone the resection of the dilated portion until a subsequent operation.

The boy made an uninterrupted recovery. Meantime, the irrigations were kept up through the artificial anus, which had been left patent. The boy's condition improved so much that his parents decided to take him home, instead of having the operation completed. He remained home for another five months, when he re-entered the hospital, having noticed, of late, some return of the abdominal distension. I then advised that the dilated portion of the colon be removed, which was done, March 21, 1907, under ether anæsthesia. An incision was made through the left rectus muscle, a number of adhesions from the former operations were freed and the bowel exposed. The ends of the dilated portions of the colon were ligated and inverted by a purse-string suture, and the entire dilated segment excised, the mesocolon being ligated in sections. The previous colocolostomy was found to be in excellent condition, and was left undisturbed. No attempt was made to cover in the raw surface of the mesocolon. Little or no hæmorrhage or shock attended the operation, and the patient made a good recovery, with the exception of a phlebitis in the left internal saphenous vein.

The artificial anus, which had been left open from the beginning as a safety valve in case of need, was subsequently closed under cocaine; and the patient has remained well up to the present time. He is now in excellent condition, aparently a normal boy in every respect, except that the costal angle is still rather wider, and the costal border more prominent, than normal.

Although the classical description of this disease given by Hirschsprung, at the meeting of the Berlin Congress for Children's Diseases in the year 1886, first brought its existence to the general attention of the profession, still the condition had been recognized by a number of observers before this time, and cases had been observed and recorded. The earliest reported cases to be found in the literature are those of Parry in 1825, and Billard in 1829. Parry's case was a male adult, who had suffered from digestive disturbances for years. Autopsy showed an enormously distended colon, containing an immense quantity of fæces. No obstruction could be found anywhere in the alimentary canal. Billard, according to Löwenstein, in 1829,r eported the autopsy findings of a six day old boy, the lower part of whose small intestine, together with the whole colon, was thickened and sclerosed. In 1836, Ebers, in an autopsy report remarkable for its clear and full description of the pathological conditions present, describes another undoubted case.

Von Ammon, in 1842, described a dilatation of the large intestine and rectum in a child shortly after birth, and recorded another observation in a fœtus at about the seventh month. It is a curious fact that these observations, having such an important bearing on the etiology of the disease, should have been noted so early, and that so few similar conditions have since been reported. Then come the reports of Oulmont, 1843; Banks, Bunfer, and Favalli, 1846; Little and Galloway, 1850; Gay in 1854.

Henock, in 1861, gives a description of a fairly typical case in a young boy. In 1867, the first case was reported from this country by Lewitt, of Chicago. This was followed three years later (1870) by Jacobi, who reported a doubtful case of abdominal loop formation with fatal kinking of the intestine. Then followed the reports of Barth, Peacock, Gee, Bristow, Morris, Fütterer, Middeldorf, Cheadle, Gaume, and others. Then appeared the first report of Hirschsprung just referred to (1886). He has supplemented this with three additional reports, four in all. Following Hirschsprung, the literature upon this subject has become very voluminous, no less than 206 communications have been found by Dr. W. A. Fisher, whom I have to thank for valuable assistance in the preparation of this paper. Of the later articles, those deserving especial mention are by Formad, Marfan, Mya, Treves, Griffith, Concetti, Fenwick, Osler, Fitz, Richardson, Eserich, Frommer, Duval, Kredel, Cheinisse, Perthes, Bing, Pfisterer, Danzinger, Löwenstein, Ito, and Soyesima.

With few exceptions, owing to their inaccessibility, or otherwise, every article upon the subject has been read by Dr. Fisher or myself, and the cases studied and tabulated. It was, at first, intended to give a complete statistical report of every case up to date. After the ex-

penditure of much time and effort, however, this idea was abandoned as unprofitable, owing to the fact that, in so many instances the cases had been so imperfectly reported, it was impossible to determine with any degree of accuracy whether or not they really were cases of Hirschsprung's Disease. This paper, then, represents a review of our knowledge of the subject up to the present time, together with a complete list of authors and their publications to January 1, 1908.

TERMS AND SYNONYMS

Various terms have been used to designate the affection under consideration — some of which depend upon the etiological conception of the disease, while others have to do only with the names of individuals. In the former class belong the terms "Megacolon Congenitum" (Mya) and "Congenital Idiopathic Dilatation of the Colon" (Hircshsprung). In the latter Hirschsprung's Disease, or Mya's Disease? The term "Giant Colon" has also been used by some authors (Formad, Osler, Futcher, etc.).

By German and Dutch authors the term "Hirschsprung's Disease" is used almost exclusively, while the French, English, and American authors prefer to call it "Congenital Idiopathic Dilatation of the Colon."

We have accepted this latter title because it is the one most commonly used, and, because it most nearly expresses our conception of the pathogenesis of the disease. There is abundant evidence that the disease has its origin in utero, in the majority of cases. The real cause still remains unknown. The term idiopathic, therefore, is but a cloak for our ignorance, and must be rejected as soon as a more perfect knowledge of the true nature of the affection warrants it.

That the affection is essentially a dilatation, and has to do in the vast majority of cases with the colon, especially the sigmoid flexure, is proven by the clinical and pathological findings in almost every case.

CLASSIFICATION

In this study we will follow, for convenience, the classification first suggested by Hirschsprung in one of his later papers, namely the division of the cases into two groups:

1. Those occurring in infancy (true megacolon).

2. Those occurring in adult life (pseudo megacolon).

This classification has been accepted by a number of later authors, notably Graanboom and Löwenstein, and is probably as satisfactory as any.

A marked difference of opinion, however, is very manifest in the writings of various authors. Many believe that, since the process is a congenital one, it can manifest itself only in early life (true megacolon). Those cases which have been observed as occurring in adults, they believe to be due to aggravated forms of constipation, a coprostasis pure and simple (pseudo megacolon).

Other observers, however, believe that the condition, when it develops late in life, is but the delayed manifestation of a congenital defect, which has existed all along, and has been brought out by the atony of the bowels incident to the time of life. Whichever of these conceptions is true, it seems to be an established fact that, while the clinical picture varies little in childhood or in adult life, still a more constant association with definite mechanical obstruction has been observed in the case of adults.

In studying the reported cases, one cannot but be struck by the predominance of the congenital element in the clinical picture of the early cases, as compared with the acquired; while, in the late cases, the reverse is true.

Marfan and Neter are very insistent upon an anatomical basis for the disease, namely, a congenital elongation associated with loop formation in the colon. While this is not true in every case, as will be pointed out later, still it is not out of place to call attention here to the fact that the large intestine, more perhaps than any other portion of the digestive tract, is liable to be the seat of malformations (Duval). The colon as a whole has a morphogenesis hardly completed, and the various changes in form, length, and position noted from time to time, are probably but variations in the progressive evolution toward a final arrangement.

The frequent anomalies are, in all probability, but reversion types. All the segments of the colon may be involved, but most often it con-

cerns only that segment whose evolution is still unfinished, e. g., the sigmoid flexure.

Johannessen has studied the position of the sigmoid in a large number of cases and finds it very variable. It may be found well above the pelvis and also in the right iliac fossa. Scokolow's investigations in this respect are of great interest. He has pointed out that the position of the sigmoid flexure is very changeable, and does not depend upon its mesentery alone but also varies with the quantity and consistency of its contents. It is easy to see how these anatomical variations might influence materially the accumulation of fæces in the colon.

ETIOLOGY

It must be admitted at the outset that little is known as to the true cause of this affection; indeed, it is a question whether a single cause could give rise to the various manifestations that have been noted by different observers as occurring in the course of the disease. The fact that so many theories as to its etiology have been advanced, is the best evidence as to the uncertainty of our knowledge of the subject. It is highly probable that more than one etiological factor is concerned in its production, as no single cause that has been thus far discovered will satisfactorily explain every case. There have been suggested from time to time in the literature, at least nine different hypotheses in the endeavor to explain the causation of the affection.

1. The first of these was offered by Barth in 1870. He sought to explain it by an abnormally long mesentery which might give rise to secondary torsion of the sigmoid. This view was later advocated by Gourevitsch. Other observers, however, speak of the mesentery as either normal or shorter than normal; indeed, in but comparatively few cases is the mesentery found by actual measurement to be unusually long.

2. Hirschsprung, in 1888, suggested the idea of the congenital origin of the disease. He considered it to be a disease sui generis, due to a morbid process acting during fœtal life, or more likely as an anomaly of development. He believes that both the dilatation and hypertrophy are congenital.

Some years later, Mya (1894) strongly advocated this view, with the exception that he believed the hypertrophy to be secondary, and not a part of the original process.

This view is substantiated by a number of observations. Billard has seen in a new-born child a large intestine, the walls of which were thickened and sclerosed. Von Ammon in a seven months fœtus found well-marked dilatation of the large intestine, and in a child dying shortly after birth, an ectasia of the lower portion of the colon and the rectum.

Hobbs and DeRichemont report the case of a male child which at birth presented such an enormous distension of the abdomen as to interfere seriously with the delivery.

Kredel, Mya, Fütterer and Middeldorpf, Escherich, and Bjorksten also report patients born with large abdomens, some of which were later found, at operation or autopsy, to have been due to dilatation and hypertrophy of the intestinal walls.

Finally, the observation of Joukovsky throws considerable light upon the pathogenesis of idiopathic dilatation of the colon. He reports finding in a new-born child an ectasia of the large intestine associated with hypertrophy of the walls of the whole intestinal tract, together with a stenosis of the duodenum and an internal mesogastric hernia. The stenosis was due to an excessive development of the folds of mucosa, associated with a hypertrophy of the walls of the duodenum.

Analogies are to be found in other parts of the intestinal tract; e. g., œsophagus, stomach, rectum, etc.

From this evidence, it would appear that both dilatation and hypertrophy have actually been observed in the new-born in a few instances, and hence Hirschsprung's idea is founded upon a definite, pathological basis.

While it is quite likely that these two conditions, namely, dilatation and hypertrophy, are not inseparably bound together, still, as a matter of fact, they are both reported present in almost every instance. It is conceivable that either of these processes may be primary and the other secondary, or that they may co-exist independently of each other. Some authors (Fenwick, Genersich) believe that hypertrophy is primary and the dilatation secondary, while others (Mya, Concetti, Walker, and Griffiths)

consider the hypertrophy to be secondary to the dilatation. The weight of evidence, both clinical and pathological, while it confirms the almost constant presence of both factors, at the same time tends to show that the dilatation is of relatively greater etiological importance than the hypertrophy, which is more apt to be secondary and functional.

3. Walker and Griffiths, in 1893, advanced the idea that this condition was due, in the first instance, to colitis becoming chronic. Great distension followed from the altered chemical changes in the fæces, much gas being produced. Such distension of the gut would naturally render peristalsis more difficult, which would be compensated for by an increase in the size of the existing muscle fibers and the formation of new ones — a true hypertrophy.

As a matter of fact, however, the colitis is described by the great majority of observers as a late manifestation, the result rather than the cause of fæcal stasis.

4. Marfan, in 1895, and later Neter thought they found the cause of the trouble in the increased length of the colon, and a multiplication and exaggeration of its loops, especially of the sigmoid flexure. They believe the dilatation and hypertrophy to be dependent upon the accumulation of gas and fæces in the elongated looped portion of the colon.

This idea of the etiological bearing of variations in the length of the sigmoid in early infancy upon subsequent digestive disturbances, has been shared by others. Jacobi called attention to it many years ago. Curshmann, in Nothnagel's system, states that the sigmoid in early life is relatively larger than the rest of the large intestine, and that we often find a persistence of the infantile condition which may at times become "monstrous." Hirschsprung in his later writings admits the possibility of the existence and influence of this anatomical factor.

While the measurements of the colon reported by some observers show an abnormal length and loop formation, many others report it as of normal length. Manifestly, then, this theory, although satisfactorily explaining some cases, does not apply to all.

This conception is, perhaps, more applicable to the disease in later years; for instance, when it is observed in the insane or in the aged, where it is clearly associated with marked inactivity of the bowels and coprostasis, with consequent dilatation and hypertrophy of a portion of the large intestine (Löwenstein).

5. Treves, in 1898, after reviewing many of the cases that had been reported up to that time, rejected the idea that the dilatation was idiopathic. He sought to explain it and the accompanying hypertrophy, as due to actual mechanical obstruction. He quoted a number of cases in support of this view, and others have since been added. As stated by him, the phenomena observed in this connection suggest in a most emphatic way that there is an obstruction to be overcome, and that the hypertrophy is quite inconsistent with the conception of an "idiopathic" dilatation of the bowel.

Unfortunately, however, for this theory as for the others, there are many cases that have come to operation or to autopsy in which careful search has failed to reveal any such obstruction.

6. Concetti, in 1899, described in a carefully studied case, a congenital aplasia of the muscular tunics of the large intestine, immediately above the rectum. He believed this to be the primary, fundamental lesion. Growing out of this as a result of the processes of fermentation and putrefaction, and the formation of gases resulting therefrom, there develops a well-marked ectasia of the intestine. Here, in turn, fæces in large quantities accumulate. Finally, the efforts of the intestine to overcome this stagnation result in the development of a well-marked hypertrophy in the segment immediately above. This hypertrophy, he believes to be due in part to connective tissue proliferation, the result of continued irritation of the vessels by the toxic substances produced by the processes of intestinal putrefaction.

In studying the reported cases, one recognizes the pathological picture drawn by Concetti with considerable frequency, but not always, by any means. The connective tissue proliferation described by him is noted only in a small percentage of cases. It was not present in our own case.

7. Fenwick, in 1900, reported a case in which he was able to demonstrate a definite spastic

contraction of the sphincter ani, associated with fissures in the anal margin. This idea of the spastic contraction of a portion of the colon has been suggested by others, notably Gee and Hichens. Since this condition is one that can be very readily recognized clinically, and since it has been reported as present in so few of the cases that have been carefully studied, it is manifestly impossible that it should play a very important rôle in the etiology of the disease.

8 In 1907, Hawkins proposed the name of "neuropathic dilatation and hypertrophy of the colon," basing it upon his conception of the etiology of the disease, namely, that it was a neuromuscular defect in one segment, through which the colon was unable to propel its contents. In this way, a functional hypertrophy of the segment immediately preceding the paralyzed and dilated one is produced. Formad (1892) had suggested the neuropathic theory of the causation of this disease, but it was not generally accepted.

Lennander (1900) urges this as the most probable explanation of the condition.

Pennato [1] (1902) considers the causative factor to be primary paralysis of a segment of the intestine.

Bing (1907) believes it to be due to changes in the nervous system, especially of the sympathetics of the intestine.

Richardson and Fitz, in this connection, call attention to the close relationship existing between this condition and phantom tumor, as showing a possible nervous origin.

On the other hand, the histological findings in the cases that have been studied microscopically show little or no change in the structure of the nervous plexuses of the intestine. The powerful peristalsis which has been observed so frequently, and to which attention has been called, renders less plausible the theory of weakness through disturbed innervation. In addition to this, the hypertrophy of the intestinal musculature so commonly present, disproves it as a constant factor.

9. Perthes, in 1905, in an elaborate report of a carefully studied case, contends that valve formation in the intestine was responsible in his case for the condition found. He was able to demonstrate a definite valve action just below the distended portion. He did this in a rather ingenious way, i. e., by injecting water through a previously established artificial anus. When injected in this way, the water would distend the bowel, but failed to pass through the valve. When injected into the rectum, it would pass through the valve and out through the artificial anus. He also demonstrated at operation the existence of the valve. This idea of the valve formation as the chief etiological factor in the disease, has been shared by others both before and after Perthes.

To Roser, perhaps, belongs the priority in suggesting it. He has described several different ways in which a valve may be formed in the intestine, but the important fact brought out is, that under certain conditions, it is actually accomplished. Since the appearance of Perthes' monograph, many of the German authors, especially, have accepted his view of the pathogenesis.

As opposed to this idea, is the inability to demonstrate the valve formation after the intestine has been removed from the body. Perthes answers this objection by calling attention to the fact that it is not an organic but a functional obstruction, due entirely to the position of the affected portion. He, himself, does not claim that it explains every case. Nothing that suggested a valve could be demonstrated in our case.

Among other hypotheses that have, from time to time, been suggested as explaining certain individual cases, may be mentioned that of Richardson, in which he thought pressure of a retroflexed uterus was largely instrumental in the production of the condition; diastasis of the recti muscles, (Levi); adhesions to surrounding structures (Murray), and atonic conditions of the intestinal walls, the result of wasting diseases (Griffith), etc.

In our own case the picture presented by the disease corresponded in every respect to, and suggested very strongly, that presented by a lymphangiectasis as it is seen in other parts of the body, i. e., macroglossia, macrocheilia, etc. Here the most striking feature, next to the immense size of the colon, was the thickness of the mesocolon, which was com-

posed chiefly of enlarged lymph glands and enormously dilated lymph and blood vessels. The dilatation of the lymphatic and vascular systems in the mescolon corresponded exactly with the dilated segment of the bowel. The whole appearance of the dilated and hypertrophied bowel suggested hypernutrition, a species of giantism, as it were, due to the increased amount of blood and lymph supplied to the affected portion. A section of the mesocolon, together wth one of the enlarged lymph glands removed at the time of the first operation, showed nothing but a marked hyperplasia. That this hypothesis could explain all the cases seems very improbable, but that it may be the cause of a considerable number, however, seems equally probable, since in a large proportion of the reported cases where the condition of the mesocolon is stated, this same thickening and hypertrophy of the lymphatic and vascular elements has been observed.

The clinical picture of the disease is usually a very pronounced one. The cardinal symptoms are, obstinate constipation and an enlarged abdomen, in a patient otherwise in fairly good health. The disease, as a rule, manifests itself very early in life, frequently the first passage of meconium is delayed several days. The constipation thus early begun may continue throughout life. In other cases, the constipation may be noticed only after a few weeks, months, or even years. Under these circumstances, a movement of the bowels is always brought about with difficulty, and rarely without the aid of enemata or cathartics, except during the periods of diarrhœa, which will be referred to later. This extreme difficulty in producing an evacuation, is one of the characteristics of the disease. Enormous quantities and great varieties of cathartics, together with frequent large enemata, have been used with little or no effect. Unusual postures, assumed by the patient during the act of defæcation or passing of gas, are reported by a number of authors, such as leaning over the back of a chair, standing on the head, knee-chest position, etc.

The distension of the abdomen may be observed at birth, soon after, or at a later period, and is due to distension of the dilated portion of the colon with gas and fæces. The dimensions of the dilated abdomen are, at times, enormous, the circumference may be greater than the height of the patient. On inspection, one is struck at once by the disparity between the size of the abdomen and the rest of the body, which is emaciated. The appearance of the abdomen is rather barrel-shaped, the greatest circumference lies usually somewhat above the umbilicus, the distance between the umbilicus and ensiform cartilage, and the umbilicus and the symphysis, being very much increased over the normal.

Just as abnormal as the dilatation of the abdomen, is the length of time during which, in many patients, there is no stool. Frequently one gets a history of the patient going a week without a movement, periods of five weeks (Johanessen), six weeks (Roth), nine weeks (Rolleston and Hayward), and three months (Gay) have been noted. After shorter or longer periods, constipation frequently alternates with diarrhœa, which usually relieves somewhat the abdominal distension, but this relief is only temporary, the abdomen never entirely regaining its normal dimensions.

The facies presents a rather dull, apathetic appearance. The skin is rather dry, harsh, and leathery, except over the distended abdomen, where it may be tense or shiny. The complexion is frequently sallow or pasty. The veins over the abdomen appear distended and prominent. The abdominal walls are thinned, and through them vigorous peristaltic waves, or coils of distended intestine, may often be observed. A diastasis of the recti muscles may, occasionally, be present. One of the most striking features is the change that takes place in the costal angle and plane of the chest wall. The former is rendered very wide and obtuse; the latter, instead of its normal approximately vertical position, as a result of the continuous pushing up of the diaphragm by the distended intestine, becomes at times, almost horizontal.

The abdominal distension may or may not be uniform. In some cases, the distended intestinal coils can be seen or felt more prominently upon one side than the other, more especially on the left side. This was pronounced in our own case. On palpation, one

may at times feel masses of hardened fæcal matter filling the distended bowel. At other times, the abdomen is everywhere soft and is as a rule, singularly free from tenderness. During the active peristalsis, the enlarged and distended loops of sigmoid can frequently be grasped in the fingers. On percussion, the abdomen may be everywhere tympanitic, owing to the great accumulation of gases in the intestine. The area of liver dullness is very much reduced, and its lower border elevated considerably above the normal. At other times, dull areas may be elicited corresponding to the fæcal impaction. Movable dullness has never been observed. Audible borborygmi have been frequently reported, sometimes so loud as to be heard in the adjoining room.

The fæcal discharges from the intestine are perhaps characteristic. Sometimes they are very dry and inspissated, at other times putty-like in consistency and of rather characteristic yellowish, brownish, or greenish color, and having a peculiarly offensive odor. At other times, the discharges, both solid and gaseous, have been noted as odorless. Vomiting is not a constant symptom, and, when it occurs, it takes place late in the course of the disease, and is usually referable to some intercurrent complication. Pain is also not a marked nor constant symptom, being more pronounced when diarrhœa is present, or during active peristalsis.

Œdema of the lower extremities and scrotum has been observed in a number of cases.

On rectal examination, the sphincter is usually normal, although Fenwick and others have described a spasm which they believe to be of etiological importance. The majority of observers, however, have failed to note anything suggesting this condition. The rectum itself is usually found to be empty and relatively normal. A ballooning of its walls has been noted, and is present in a considerable percentage of cases. This is of some significance as indicating an obstruction farther up. Anal fissures are rarely present. A rectal tube can usually be passed unobstructed for a considerable distance, frequently evacuating large quantities of gas or liquid fæces.

Marked disturbances have been observed from time to time in the other structures of the body. The lungs will be found encroached upon by the changed position of the liver, and the upward pressure of the diaphragm. The lower lobes of the lungs may be more or less atalectalic. Breathing will be largely costal. Dyspnœa, which may not be noticed at the beginning, may later become pronounced, interfering very seriously with the comfort and, perhaps, life of the patient. Bronchitis or bronchopneumonia are not infrequently observed later in the course of the disease, due, in all probability, to disturbed conditions in the chest, possibly to metastasis from the intestinal obstruction. The heart's action may also become very much interfered with, producing a weak and irregular pulse, dyspnœa, etc. The kidney function appears to be seldom disturbed — which seems surprising, owing to the increased intraabdominal pressure, and the weight of the mass of contained fæces. Gee reports a case of double hydronephrosis associated with this condition, and Fenwick one of compression of both ureters with grave hæmaturia. Roth has observed, in two cases, a peculiar deformity of the bladder, consisting of a cone-shaped dilatation extending to the umbilicus. Germer and others have also observed this and it was present in one of the Johns Hopkins Hospital list. Great increase in the amount of indican has been observed; albumen and casts are not usually found.[1]

[1]There have been eleven cases observed in the Johns Hopkins Hospital up to January 1, 1908, 9 males and 2 females, 7 whites and 4 blacks. The ages have ranged from seven months to fifty-five years, though nearly all were in children, to-wit, one at seven months, one at one year, one at nineteen months, one at three years, two at four years, one at six years, one at nine years, one at ten years, one at thirteen, and one at fifty-five years, the last being the first case admitted to the hospital. Six cases were admitted on the medical side, two being later on transferred to the surgical side. Five cases were admitted on the surgical side, one being treated three years later on the medical side. In three cases, colostomy was done, death following in one case from peritonitis. With the exception of this death, all the other cases were discharged improved, except one which was not treated.

	Sex.	R'ce	Age.	Yr. of Admis.	Service.	Discharged.	Treatment
Rosa Callahan	F.	W.	55	1891	Medical	Improved	Medical
Ralph Aldeman	M.	W.	7 mo.	'92	Medical	Improved	Medical
John White	M	C.	10 yr	'92–95	Med. & Surg.	Improved	Colostomy
J. A. Page	M	C.	9 yr.	'02–'4	Medical	Well	Medical
J. D. Axel	M	W.	4 yr.	'04	Surgical	Improved	"
Claudius Klein	M	W.	6 yr	'07	Surgical	Improved	"
Chas. Cole	M	C.	12 yr	'08–00	Med. & Surg.	Died Peritonitis	Colostomy
Chas. McCarthy	M.	W.	4 yr	1900	Medical	Improved	Medical
Geo. Muhlberg	M.	W.	3 yr.	'00–04	Surg. & Med.	Improved Also had tb. peritonitis	"
Endrew Edwards	M	C.	13 yr	'06	Surgical	Improved	Colostomy
Evelyn Griffith	F.	W.	19 mo.	'07	Med. & Surg.	Not treated	

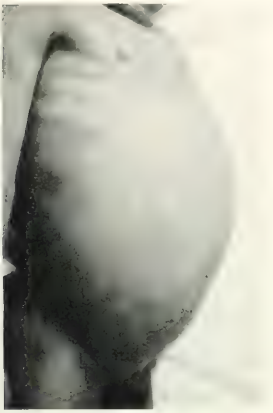


Fig. 1.

Figs. 1, 2, 3, show one of the Johns Hopkins Hospital series.

Fig. 3.

Fig. 2

Van der Kolk, more than fifty years ago, called attention to the frequent occurrence of dilatation of the colon in cases of chronic insanity and regarded it as one of its pathological conditions (Hurd). In this connection it is interesting to note that, since this paper was begun, I was called to one of the State Hospitals for the Insane to see one of the inmates, whom I found to be suffering from a form of intestinal obstruction very closely resembling pseudomegacolon. Indeed, I believe it may properly be classed as such.[2]

The nervous system does not seem to be directly affected by the disease. Children, in the later stages, often become apathetic and somnolent. Convulsions have been observed in a few instances. Fitz and Richardson call attention[3] to the close relationship existing

[2] A. H. W. [illegible] Single. Male. Mildly demented. Three years ago the abdomen began to distend rapidly; complained of some pain. Tube passed at this time without any difficulty. It was not possible to obtain any movement from the bowels either by purgatives or enemata. Three days later, bowels were moved by means of castor oil and the condition returned to normal. Since that time, he has had three similar attacks which lasted for two or three days, the last one in January, 1908. At this time the same condition was noticed, except that it was more aggravated than in the previous attacks. Upon examination, there is an enormous distension of the abdomen, the middle portion projecting forward while the flanks were relatively flat; skin is tense and stretched, the abdominal veins much distended and the intestinal patterns well marked, being more pronounced on the left than on the right side. There is visible violent peristalsis, and loud borborygmi can be heard. The intestinal coils can easily be grasped in the hand. The abdomen is everywhere tympanitic and no mass is to be felt. Rectal examination is [illegible]

Fig. 4.—Escherich's case.

between this condition and phantom tumor. Perthes describes a severe pain in the shoulders which he observed in both of his patients. Symptoms suggesting meningitis have been reported by Berti, Bernheim, and others. An interesting case of gastric tetany has recently been reported by Langmead.

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS

The diagnosis is based upon two chief symptoms, namely, chronic obstipation and meteorism. When these two symptoms, as they frequently do, become very pronounced, the diagnosis in both children and adults is rendered easy, as there are very few conditions with which the clinical picture is likely to be confused. So striking is it in pronounced cases, that one cannot well fail of a correct diagnosis. In children, particularly those who are of a rachitic tendency, or the victims of malnutrition, the wan, pinched expression, sunken cheeks, sallow complexion, emaciated extremities in marked contrast to the at times enormous balloon-like distension of the abdomen, form a picture that is easily recognized. (See fig. 4, Escherich's case.) In adults the same symptoms are often present, only to a less degree. The conditions which have been most often mistaken for the trouble are, tubercular peritonitis, and some forms of chronic ileus, such as volvulus, anular carcinoma of the intestine, dysenteric ulceration, ovarian cysts, etc. Heredity does not play a very important part in the diagnosis, as in only a few instances has it been observed. Duhamel and Bing report cases, and in the Johns Hopkins Hospital series, father and daughter were affected.

The disease is more common in boys than in girls. Of one hundred and twelve patients analysed by Löwenstein, eighty-seven occurred in the male, and twenty-five in the female — a proportion of three and one-half to one. In adults, the ratio between the sexes is different, being in the proportion of two to one in favor of the male. The disease runs a very chronic course, stretching over periods of years, or even a comparatively long life time. On the other hand, in a few instances reported by Pfisterer, Hirschsprung, and others, the patients succumbed after a period of six and ten weeks, respectively.

The course of the disease is irregular. Periods of improvement may be noticed from time to time, but exacerbations often follow, and, even when the prescribed treatment is scrupulously carried out, the results are not always satisfactory. The disease usually makes its appearance soon after birth. Of those cases where the time of onset has been recorded, seventy per cent occurred immediately after birth, and about twenty per cent within a few days, or weeks. In a much smaller percentage, it appears after a period of years. On account of the severity of the symptoms, recourse is had early to cathartics and enemata, the absolute necessity for which, is one of the important diagnostic points. The alternation of obstipation with spontaneous diarrhœa; the character of the discharges; the frequent lack of relief from the abdominal distension, in spite of profuse and frequent evacuations, particularly in the case of small children; the gradual or rapid decline associated later with symptoms of intestinal perforation, or with some intercurrent affection, possibly pulmonary in character, all point strongly toward this condition. The fact that children who have suffered from constipation from birth frequently do not consult a doctor until some years later, gives rise to the supposition that possibly many of the milder grades of this disease never come to

the physician's notice, and hence are not recognized.

Taking all these facts into consideration, if in addition an examination of the abdomen shows no tumor formation other than that accounted for by fæcal accumulation; and examination of the rectum reveals no obstruction low down in the bowel, the strong presumption is that we are dealing with Hirschsprung's Disease.

As special aids to diagnosis in doubtful cases, enemata of bismuth and oil given in the knee-chest position, and an X-ray subsequently taken in the abdominal position, will give a fairly characteristic shadow. If the bismuth does not show in the descending or transverse colon, the distended loop must be the sigmoid. An X-ray taken after the insertion into the rectum of a metal tube may also aid in determining the location of the affected segment. Diaphanoscopy may also be, at times, of service. In differentiating between tubercular peritonitis and this disease, it is well to bear in mind that ascites has never been observed in connection with Hirschsprung's Disease.

PROGNOSIS

The prognosis in Hirschsprung's Disease is always uncertain. While the disease itself is rarely rapidly fatal, still the patient always leads a precarious existence, owing to malnutrition and digestive disturbances incident to the trouble. Intercurrent affections are very commonly observed, and not infrequently the cause of death is due to one of these. Peritonitis, the result of perforation, heart failure, and diseases of the respiratory organs, particularly bronchitis and bronchopneumonia, are the most common of the intercurrent affections.

The prognosis is influenced by the age of the patient; the younger the individual, the more unfavorable the prognosis.

TREATMENT

The treatment of this disease may be divided into medical and surgical. Medical treatment consists of the therapeutic agents usually employed in chronic constipation, namely, cathartics, enemata, the use of the rectal tube, massage, electricity, tonics, exercise, regulation of the diet, etc. Schreiber lauds the opium treatment, and reports a cured case, with co-existent enterospasm.

The surgical treatment has varied much in the hands of different surgeons, and may be classified as follows:

Intestinal puncture, either through the abdominal wall or after laparotomy. A considerable number of cases are to be found in the literature which have been treated in this very unsurgical manner. The relief is usually only temporary, and the ultimate result unsatisfactory.

Exploratory laparotomy alone, as a diagnostic aid, has been employed in at least twenty cases. In some instances, the abdomen was closed immediately, in others the contents of the dilated intestine has been milked out through the anus.

Colotomy with evacuation of the contents of the bowel, and immediate closure, has been done eight times with fairly satisfactory results.

Colostomy has been performed according to Ito and Soyesima twenty-three times. As a preliminary to a more radical operation, this is a very valuable aid. It also gives opportunity to make a positive diagnosis. A few cases have recovered with a permanent fistula. Colonplication has been used by Kredel, Franke, and others, and the results reported do not justify its continued use.

Colopexy has been tried a number of times. Treves and Richardson report failures, but the majority of cases observed long enough have been fairly satisfactory.

Entero-anastomosis without resection has given good results in most cases. Pfisterer and others, however, have reported failures. In our own case, the entero-anastomosis, even with a persisting fæcal fistula, failed to prevent the continued accumulation of fæces in the distended loop.

Lingeman and Franke report cases of what they call "shunting off of the distended loop," an operation similar to entero-anastomosis. Both cases, however, died of peritonitis.

Perthes made use of a procedure similar to the operation of pyloroplasty for pyloric obstruction. The result in his case was unsatisfactory. Morris tried splitting of the soft parts posteriorly after the modified Kraske operation on the sacrum, and evacuated the

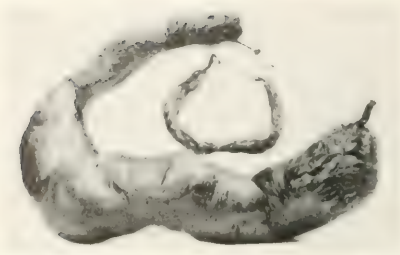


Fig. 5. Specimen from Formad's case, with normal colon for comparison.

intestinal contents after introducing the arm into the bowel.

Treves amputated almost the entire large intestine, including the rectum, bringing the splenic flexure out of the anus. Resection of the affected portion with subsequent entero-anastomosis has been performed twenty-one times with good results in fourteen cases. This is unquestionably the operation of choice, other things being equal.

The technique employed in our case proved most satisfactory. It differs materially from the method usually employed, in that the preliminary colostomy is made in healthy bowel above the dilated segment. After this segment has been relieved of its impacted contents and recovered somewhat its normal size, the second operation, consisting of a lateral entero-anastomosis between the segments immediately above and below the distended portion, is performed. After a sufficient time has elapsed for the patient to recover entirely from the preceding operations, the third step in the procedure is taken. This consists in resection of the whole of the affected portion of the colon, with closure of the free ends of the intestine. The advantages of this method over any other are, first, that the colostomy is made in healthy bowel at a point where it can remain undisturbed as long as desired; second, it is left as a safety valve until all the stages of the operation have been accomplished, when it is finally closed under cocaine.

In an interesting table comparing the results of medical and surgical treatment, Löwenstein gives the following figures: Of fifty-nine cases treated medically, thirty-nine died, a mortality of sixty-six per cent; nine were improved, four unimproved and seven entirely well, a recovery rate of 12 per cent; while of forty-four cases treated surgically, twenty-one died, a mortality rate of forty-eight per cent. Two remained unimproved, seven were improved, while fifteen were completely cured, a recovery rate of thirty-four per cent. From this table it would appear that surgical treatment has a mortality rate two-thirds that obtained by medical measures, and a recovery rate almost three times as great.

PATHOLOGY

The principal seat of the pathological process is in the large intestine, and in more than one-third of all the cases, the sigmoid flexure is alone involved. In practically all the cases it is included in the affected portion. The whole of the large intestine was found involved in about 15 per cent of the cases. The rectum and the small intestine are rarely affected. In addition to the small intestine, the stomach (Gourevitch), the appendix (Muhlberger and Tschernow), and the œsophagus (Bergman), have been reported as taking part in the dilatation. The transition from the normal dilated portion is usually gradual, but may be abrupt, whereas the transition from the dilated portion to the normal is usually the reverse. There may or may not be evidence of mechanical obstruction of one form or another. These demonstrable forms of mechanical obstruction are more frequently met with in the adult than in the child, and may give rise to symptoms erroneously classified as Hirschsprung's Disease. A pathological study of many of the cases reported as Hirschsprung's Disease would undoubtedly show them to be cases of pseudo-megacolon. As pointed out by Perthes, the characteristic of congenital idiopathic dilatation of the colon (true megacolon) is the inability to demonstrate at operation, or autopsy, a definite mechanical obstruction. Upon opening the abdomen of a patient the subject of this disease, one is at once struck by the enormous dilatation of the colon in whole or in part. The dimensions of the dilated portion are at times prodigious, reaching a diameter of six to eight inches (Treves, Haw-

kins, Formad, etc.). Its capacity is, at times, even more striking. Peacock's case contained sixteen litres, Formad's cases forty pounds, etc. The dilated portion occupies a rather characteristic position in the abdomen, filling almost the entire cavity, pushing aside and compressing the small intestines and the remaining organs, frequently obscuring them entirely from view. The large intestine, instead of following its usual arrangement, disposes itself in two parallel limbs, running more or less perpendicularly.

The walls of the intestine show marked changes, the result of the dilatation and hypertrophy. The serous coat is usually roughened, the tæniæ less pronounced, or obliterated. The whole colon may, at times appear elongated, with increased loop formation as described by Marfan and Neter.

In advanced cases, peritonitis may be present, due to necrosis of the intestinal wall and resulting perforation. External evidences of this necrosis may be found in the bowel wall, which is palpably thickened in most cases. The mesocolon is the seat of well-marked changes, consisting in variations in length, sometimes longer and sometimes shorter. At times, it is of great thickness, due to the immense increase in the lymphatic and vascular elements, as manifested in the enormous dilatation of the lymph and blood vessels and the increased size of the lymph glands, a condition resembling very closely lymphangiectasis Upon opening the intestine, fæces in large quantities may be evacuated. As has been already pointed out, the intestinal contents are rather characteristic in color, consistency, and odor. The mucosa is frequently markedly pigmented, sharing to a certain extent in the hypertrophy of the rest of the intestinal wall. Patches of ulceration can frequently be seen, occupying larger or smaller areas and varying in depth from slight erosions to complete perforation.

Microscopic examination of the wall of the tremendous colon of Hirschsprung's Disease shows an interesting picture. In general, we have to deal with a quite uniform hypertrophy of all of the intestinal tunics, especially marked, however, in the muscularis. Grafted, as it were, on this hypertrophy are many degenerative changes.

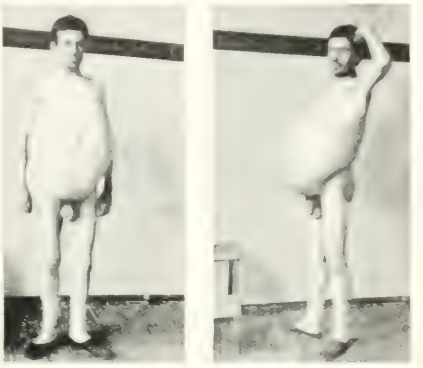


Fig. 6.—Formad's case.

I have been able to compare the changes seen in the case here reported with those found in one kindly given me for study by Professor W. G. MacCallum. Dr. MacCallum's specimen is from an undoubted congenital case of Hirschsprung's Disease, the clinical history of which is in the surgical department of the Johns Hopkins Hospital. It will be referred to as Pathological No. 1497.

The description of our present case may be best given by a brief account of the different tunics of the bowel wall.

The mucosa in this case is everywhere almost twice its normal depth, being much thickened by a diffuse round cell infiltration. In addition, there is a marked increase of the stationary or usual connective tissue cells, forming the stroma of the mucosa. The mucosal vessels (especially the veins) are undoubtedly enlarged, but by no means disproportionately so when one considers the growth of the entire mucosa here, and the great size of the normal mucosal veins in the human colon. The mucosa is loaded with yellowish brown amorphous pigment masses, which account for the very noticeably pigmented appearance which it presents even to the naked eye. On opening the colon in most of these cases, the deep mucosal pigmentation has been remarked on by the observer. It is generally a deep, velvety brown, but may, as was the case in the specimen No. 1497, be almost black. The pig-

Fig. 7. Cross-section gland-tube wall. ×70.

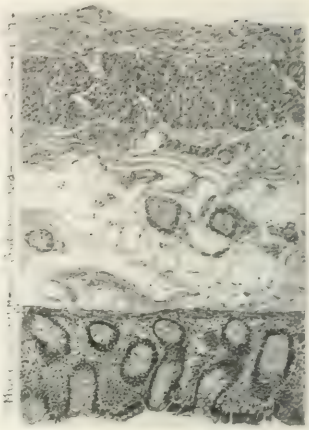
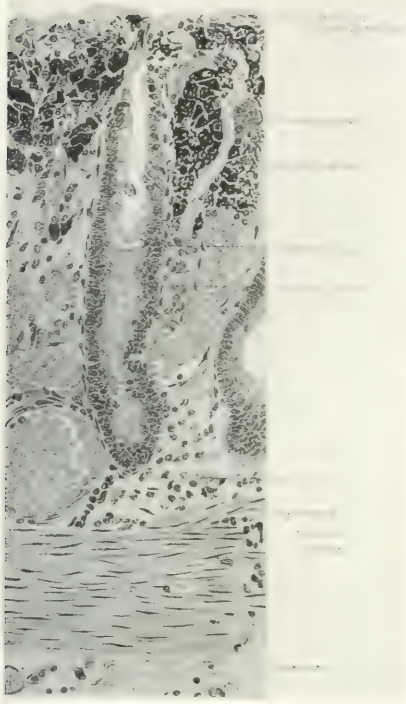
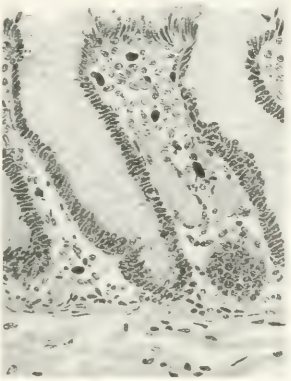


Fig. 8. [illegible] (executed criminal.) ×70.

ment, sometimes free, is oftenest enclosed in the connective tissue cells and does not appear to differ, except in amount, from that always present. (*Vide* Figures 7 and 8.) It is not improbably associated with the stasis of fæces for prolonged intervals. These changes are in some places associated with the presence of fewer of the crypts of Lieberkuhn, but in other areas certainly these are not reduced in number. The surface epithelium is frequently missing, but where present is clearly seen to be more cubical than cylindrical in type. It is not difficult to find goblet cells in the crypts, but they are certainly far less numerous than in the normal colon, where anyone familiar with this region will remember most of the cells are always distended with mucus.

In general, then, it is possible to recognize in the changes which the mucosal layer presents, a chronic inflammation, for we have here round cell infiltration, growth of the fixed connective tisssue cells of the region, together with the blood-vessels and evidences of degeneration of the superficial epithelium. The stimulus, no doubt, has been the proximity of large, retained fæcal masses — a factor frequently potent enough, as the literature shows, to cause deep ulcers, necrosis of the





entire intestinal wall, with consequent peritonitis. In the present cases, no evidence of mucosal ulcers of any extent was found.

The muscularis mucosæ is very considerably hypertrophied, though by no means as greatly as in other reported cases. Its growth has occurred chiefly, or almost entirely, in the circular fibers. They appear healthy in all respects and show none of the fibrous tissue invasion or leucocytic infiltration seen by other observers. It is interesting to note here that we may be justified in also associating the growth of the mucosal muscular coat with the presence of hard, intestinal contents, such as dense fæcal scybala, inasmuch as the studies of Disse and others in comparative histology show an apparently delicate response in the thickness of the muscularis mucosæ in accordance with the hardness of the food and dejecta — changes which were seen by Walker and Griffiths, and by Fütterer and Middeldorpf.

It is difficult to see why a well-marked case of Hirschsprung's Disease would not necessarily give rise to some of the changes in the mucosa just described, and one wonders whether closer scrutiny would not reveal them in those cases where the mucosa has been reported normal, e. g., Bing's cases.

The submucosa, in some places thin, in others thick, shows large fasicles of connective tissue. The vessels of Heller's plexus are especially large, and show in many sections, obliterative endarteritic changes. The ganglion cells of Meissner's plexus were normally abundant, and exhibited no sign of degeneration, being seen beautifully after the usual stains, and apparently healthy.

Of the muscle coats, the circular one is relatively huge, occupying in some places 42 per cent of the entire thickness of the intestinal wall, whereas it normally is seldom in excess of some 20 per cent. This is in accord with the findings in many of these cases.

Ganglion cells belonging to the nodes of the

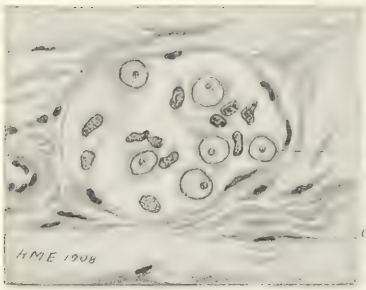


Fig. 11. Ganglion cells at one of the nodal points of Meisner's plexus in the wall of giant colon. (Case here reported.) *g, c*, Sympathetic ganglion cells. *c, t*, Connective tissue cells. Drawn under camera lucida ×600.

plexus of Auerbach were seen in several fortunate sections and showed no departure from the normal. In fact, if anything, the nerve cells of both plexuses were in slightly larger clumps than normal, and in all cases in a perfect state of preservation.

It is of interest to note that, in some sections of the other case studied (Path. No. 1497), remarkable degenerative areas were found in the submucosa. In such spots, there is a complete hyaline transformation of this tunic, no evidence of structure remaining, save a few vascular channels. It is in such areas as these, causing an obvious weakening of the bowel wall, that some have preferred to see the etiology of the disease (Walker and Griffiths). They are almost certainly secondary changes in the life history of the enlarged gut.

The gigantic circularis seems always a prominent feature, but in some cases it is prevented from forming a great relative proportion of the gut wall by the great width of other coats, notably the submucosa (Mya and Concetti). In specimen No. 1497, the circular coat attained a greater thickness than the entire normal wall (1.7 mm.) and constituted almost 50 per cent of the whole thickness of the bowel.

The longitudinal muscle coat was uniformly distributed, showing little evidence of any localization of the fibers into definite tæniæ. It is some four times the normal thickness.

Well-differentiated Van Giesen stains do not demonstrate any considerable connective tissue invasion of the muscular coats as has been reported by Mya, Concetti, and others. The muscle cells are everywhere, in most respects, normal in appearance and apparently functioning. They do not impress one as the various sized fibers of a myomatous growth.

The serosa was considerably thickened and showed the presence of greatly enlarged lymphatics and blood-vessels. A table is given below comparing the measurements of the different bowel tunics in the two cases here studied, in a normal well-distended colon, and in the cases reported by Mya and Concetti, respectively.

Cases	Mucosa	Muscularis mucosæ	Submucosa	Circularis	Longitudinalis	Serosa	Total
	MM	MM	MM	MM.	MM		
Mya's case	.055	.22	.55	[illegible]	.035	[illegible]	[illegible]
Concetti's	.513	.105	1.350	.417	.447	.057	2.52
Present case 2 dif. areas	.520 .506	.050 .075	.220 .900	.750 .450	.220 .290	.020 .030	1.77 2.16
Path. No. 1497.	.880	.120	1.425	1.670	.085	.010	3.55
Normal colon	.240	.015	.225	.175	.050	.005	.850

The greatest interest in the pathological anatomy lies in what suggestions it might give as to the causative factors involved. One must say frankly that here, as often elsewhere, no real light has been shed on the question of pathogenesis. This statement is certainly true, in spite of the various interpretations of the histological picture which have been made from time to time.

That picture may be considered as relatively constant now, for on it all careful reports agree. It will support most of the various theories which have been advanced to explain Hirschsprung's Disease, it will prove none of them.

Some of the adherents of the anomaly of development theory explain the changes as consequent on some defect in the nervous elements of the gut wall, leading to impairment of the peristaltic wave—perhaps, as some one has remarked, to a non-coordinated peristalsis. Indeed, there has been repeated suggestion of congenital absence of the normal nervous plexuses in the colon wall

No adequate studies of either the physiologi-

cal or anatomical condition of the nerve elements in these colons have ever been made. It is practically impossible to find any previous record of the condition of the nerve cells or of their presence or absence, so that the suggestion of nervous defects does not seem to have rested on any definite observations. Search in the two cases here reported has shown intact and apparently healthy ganglion cells in both Meisner's and Auerbach's plexuses (*Vide* Fig. 11).

In degenerative areas, it is true, the nerve mechanism has suffered, but, as has been emphasized, such changes are clearly secondary incidents in the life history of the enlarged bowel, and to be correlated with other senile processes, such as the overgrowth of the vascular coats, etc.

The immense size of the blood and lymph vascular systems might well suggest this as a factor in etiology, and that the giant bowel has resulted from "over-nourishment," as it were, caused also as a developmental anomaly. It is not unlikely, however, that the vessels have simply grown pari passu with the enlarging colon; at present no proof can be adduced of their rôle in pathogenesis.

It is only natural that any one who has seen the effects of experimental obstructions in the intestinal tract of animals, would turn to these mechanical causes as a simpler, and, perhaps, quite as plausible, cause of the disease. For, though there can be no longer any doubt that an obstruction does not exist at the time many cases are seen, we do not know, as Marchand remarks, whether hindrance to evacuation or peristalsis originally present could not have led to dilatation which now, making effective peristalsis more difficult, caused hypertrophy and the other changes, inaugurating a vicious circle. It is important, in this connection, to note that, in several experimental hypertrophies which have recently been recorded, the histological structure of the bowel strikingly resembles that seen often in Hirschsprung's Disease. Light may come, then, from experimental pathology. I wish to acknowledge my indebtedness to Mr. H. M. Evans, of the Johns Hopkins Medical School, for the accompanying drawings and for valuable assistance in the preparation of this paper.

BIBLIOGRAPHY

Ahlberg. Allm. Sven. Lakartid., Stockholm, 1906. iii, p. 209.

V. Ammon. Die angeborenen chir. Krankheiten d. Menschen. Atlas Tafel ix, Berlin, 1842.

Baginsky. Berl. Klin. Wochenschr., 1904, No. 48. p. 1252.

Banks. Dublin Quart. Jour. Med. Sc., 1846, vol. 1, p. 235.

Baron. Jahrbh. f. Kinderheilk., 1907, vol. lxvi, p. 741.

Barth. Wagner's Archiv. d. Heilk., xi, 1870, p. 119.

Bastianelli. Oral communication to Concetti.

Baumgartner. Presse Med., Oct., 1907.

Beighing. La Clinica Medica Italiana, vol. xl. Part 1.

Berghinz. La Clinica Medica Italiana, 1901, p. 26.

Bernheim-Karrer. Verhandl. d. Versmm., d. Gesellsch. f. Kinderheilk., Stuttgart, 1906, p. 170.

Berry. Trans. Path. Soc., 1894, vol. xlv, p. 84.

Bertelsmann. Verhand. d. Deutsch. Gesellsch. f. Chir., 1905, p. 163.

Berti. La Pedriatria, 1895, p. 116.

Billard. Die Krankheiten d. Neugeborenen u. Sauglinge Weimar, 1829–37, p. 331.

Bing. Archiv. f. Kinderheilk., 1906, vol. xllv, p. 59.

Bittorf. Münchnr. Med. Wochensch., 1906 vol. liii, p. 265.

Bjorksten. Jahrbuch f. Kinderheilk., 1902, vol. lv, p. 714.

Borelius. Verhandlg. d. Deutsch. Gesellsch. f. Chir., 1905, p. 162.

Bossowski. Przeglad Lekarski, 1899, vol. xxxviii, p. 225.

Braun. Verhandl. d. Gesel. d. Naturforscher. u. Aerzten Cassel, 1903, vol. ii. p. 143.

Bretano. Verhandl. d. Deutsch. Gesellsch. f. Chir., 1904, p. 265.

Bristowe. Brit. Med. Jour., 1885, vol. i, p. 1085.

Broadbent. Lancet, 1888, Feb. 4, vol. i.

Brook. Brit. Med. Jour., 1905.

Bruning. Deutsch. Med. Wochensch., 1905, No. 10, p. 408.

Cahen-Brach. Verhand. d. Geselsch. f. Kinderheilk, vol. xx, p. 6.

Chapman. Brit. Med. Jour., 1878, vol. i, p. 566.

Cheadle. Lancet, 1886, vol. ii, p. 1063.

Cheadle. Lancet, 1898, vol. i, p. 399.

Chiari. Verhandl. d. Deutsch. Patholog. Gesellsch. Breslau, 1904.

Cheinesse. La Semaine Médicale, 1904, p. 369.

Clutton. Trans. Clin. Soc., 1897, vol. xxx, p. 24.

Concetti. Bull. del. R. Acad. Med. di Roma, 1898–99, vol. xxv, p. 787.

Concetti. Archiv. f. Kinderheilk., 1899, vol. xxvii, p. 319.

Dagnini. Bull. del. Scienza Med. di Bologna, 1898.

Danzinger. Inaug. Dissert. Göttingen, 1907.

Delkeskamp. Müchener Med. Wochensch., 1906, p. 166.

Doberauer. Prager Med. Wochenschr., 1906, No. 31.

Drew. Lancet, 1905, vol. i.

Duhamel. Inaug. Dissert., Strassburg, 1899.

Duplex. Bull. del Soc. Anat. Paris, 1877, p. 493.
Duval. Revue de Chir., 1903, vol xxvii, p. 332.
Ebers. Hufeland's Jour., 1836, lxxxiii, p. 62.
Edsal. Archiv. Pediatrics, 1903, p. 936.
Eisenhart. Centralbl. f. innere Med., 1894, p. 1053.
Eisenschitz. Weiner Med. Wochensch., 1906, No. 2
Elliott. Annals of Surgery, 1899
Escherich. Mitteil. d. Vereins de. Aerzte in Steiermark, 1901.
Escherich. Berliner Klin. Therap. Wochensch., 1906, vol. xiii, p. 55–60.
Escherich. Weiner Klin. Therap. Wochensch., 1906, vol. xiii, p. 61–68.
Evans and Brenizer. Notes on the Resection of Large Portions of the Small Intestine, Bull. Johns Hopkins Hospital, xvii, 201, December, 1907.
Favalli. Gaz. Med. di Milano, 1846, vol. v, p. 213.
Fenton. Edinburg Med. Jour., 1903.
Fenwick. Brit. Med. Jour., 1900, vol. ii, p. 554.
Finizio. Med. Ital. Napoli, 1906, vol. v, p. 84–86.
Fisher. Pediatrics, May, 1091.
Fitz. Amer. Jour. Med. Soc., 1899, vol. cxviii, p. 125.
Fletcher and Robinson. Brit. Med. Jour., 1907, vol. i, p. 370.
Forkel. Deutsch. Med. Wochensch., 1905, p. 344.
Formad. Univ. Med. Mag., Phila., 1892, vol. iv, p. 625.
Franke. Verhandl. d. Deutsch. Gesellsch. f. Chir., 1902, p. 262.
Franke. Verhandl. d. Deutsch. Gesellsch. f. Chir., 1905, p. 165.
V. Frey. Brun's Beitr. z. Klin. Chir., 1896, vol. xvii, p. 123.
Friedheim. Deutsch. Med. Wochensch., 1904, p. 1365.
Frommer. Archiv. f. klin. Chir., 1902, vol. lxvii, p. 27.
Futcher. Johns Hopkins Hospital Bull., 1900, vol. xi, p. 114.
Fütterer and Middeldorpf. Virchow's Archiv., 1886, vol. cvi, p. 555.
Gaume. Revue des Malad. de l'Enfance, 1886, vol. ix, p. 155.
Gay. Trans. Path. Soc., 1854, vol. v, p. 174.
Gee. St. Barthol. Hosp. Reports, 1884, vol. xx, p. 19.
Genersich. Jahrb. f. Kinderheilk., 1893, vol. xxxvii, p. 91.
Germer. Deutsch. Zeitschr. f. Chir., 1707, vol. lxxxix, p. 385.
Giordano. Archiv. Internat. de Chir., 1903, vol.i, p. 95.
Goodhart. Trans. Clin. Soc., 1881, vol. xiv, p. 84.
Goppert. Archiv. f. Verdauungskrankheiten, 1899, vol. v, p. 175.
Gourevitsch. Prager Med. Wochensch., 1904, vol. xxix, p. 607.
Graanboom. Nederlandsch. Tijdschrift voor Geneeskunde, 1905, p. 442.
Graetzer. Centralbl. f. Kinderheilk., 1906, No. 1.
Grey. Brit. Med. Jour., 1905, vol. i, p. 33.
Griffith. Amer. Jour. Med. Sciences, 1899, vol. cxviii, p. 283.
Groen. Norsk Magazin for Lægevidenskaben, 1858.
Gruber. Virchow's Archiv., 1872, vol. lvi, p. 432.
Grunberg. Munchener Med. Wochensch., 1901, No. 33
Gwynne. Quart. Med. Jour., 1902, vol. ii.
Hadden. Internat. Clinics, 1893, vol. iv, p. 48.
Halsted. Archiv. of Pediat., 1893, vol. xiii.
Hand and Stewart. Pediatrics, 1902, vol. ix, p. 123.
Harrigan. Amer. Jour. Med. Sciences, 1899.
Harrington. Chicago Med. Jour. & Exam., 1878, vol. xxxvi, p. 400.
Harvey. Med. Record, N. Y., 1907, vol. lxxii, p. 481.
Hawkins. Brit. Med. Jour., 1907, vol. i, p. 477.
Heimann. Jahrb. f. Kinderheilk., 1904, vol. ix, p. 432.
Henoch. Beitr. zur Kinderheilk., 1861, p. 123.
Herringham and Clark. Brit. Med. Jour., 1894 vol. ii, p. 1240.
Hichens. Lancet, 1898, vol. ii, p. 1121.
Hilbert. Deutsch. med. Wochensch., 1905, vol. xxxi, p. 2035.
Hirschsprung. Jahrb. f. Kinderheilk., 1888, vol xxvii, p. 1.
Hirschsprung. Festschrift f. Henoch, 1890, p. 78.
Hirschsprung. Berliner klin. Wochensch., 1899, No 44.
Hirschsprung. Hospital-Stidende, 1899, No. 7.
Hirschsprung. Traité des Maladies de l'Enfance Grancher & Comby. Tome ii, Paris, 1904.
Hobbs and de Richmond. La Medicine moderne 1898, vol. ix, p. 652.
Hue. Normandie Med. Rouen., 1907, vol. xxii, p. 230.
Hughes. Trans. Path. Soc. Phila., 1887, vol. xiii, p. 40.
Hurd. Johns Hopkins Hosp., Bull., 1893, vol. iv, p. 42.
Ibrahim. Deutsch. med. Wochensch., 1905, vol. xxxi, p. 905.
Ito. Jikwa Zasshi, Tokyo, 1907, No. 80.
Jacobi. Amer. Jour. Obstetrics, 1870, vol. ii, p. 96.
Jacobi. Archiv. of Pedriatrics, 1893, vol. x, p. 1046.
Johannessen. Norsk Magazin for Lægevidenskaben, 1900, vol. xv, p. 276.
Johannessen. Revue mens. des Malad. de l'Enfance, 1900, p. 65.
Joukovsky. Med. Obozr., 1903, vol. lix, p. 7.
Kien. Strassbr. med. Zeitung, 1904.
Kinno. Jikwa Zasshi, Tokyo, 1905, No. 64.
Kocher. Mitteil. a. d. Grenzgb. d. Med. u. Chir., vol. iv.
Kraske. Münchener med. Wochensch., 1906, vol. liii, p. 2418.
Kredel Zeitschr. f. klin. Med., 1904, vol. liii, p. 9.
Kummell. Verhand. d. Deutsch. Naturf. u. Aerzte, in Hamburg, 1901.
Lacave. Verhand. van hit Genootschapter Bevood des Geness en Heilkunde te Amsterdam, 1885, vol. ii, p. 7.
Lambrior. Bull. Soc. d. Med. et Nat. de Jassy, 1906, xx, p. 209.
Langmead. Trans. Clin. Soc., 1906, vol. xxxix, p. 48.
Lengemann. Verhand d. Deutsch. Gesellsch. f. Chir., 1907.
Lennander. Nord. Med. Archiv., 1900, vol. xi.

Lespinasse. Jour. de Med. de Bordeaux, 1888–1889, vol. xviii, p. 427.

Levi. Archiv. of Pediatrics, 1903, vol. xx, p. 935.

Lewitt. Med. Jour. of Chicago, 1867, vol. xxiv, p. 359.

Linck. Inaug. Dissert. Königsberg, 1906.

Little and Callaway. Trans. Path. Soc., 1850–1851, vol. iii, p. 106.

Löwenstein. Centralbl. f. Allg. Path., 1907, vol. xviii, p. 929.

Lunn. Lancet, 1899, vol. i.

Marchand. Münchener med. Wochensch., 1903, p. 351.

Marchand. Sitzungsbericht der Leipziger. Gesellschaft, am 20, January, 1903.

Marfan. Traité des Maladies de l'Enfance, Grancher-Domby, 1897, vol. ii.

Marfan. Rev. mens. de Malad. de l'Enfance, 1895, vol. iv.

Martin. Montreal Med. Jour., 1897, vol. xxv, p. 697.

McClurg and Derge. A Study of the Intestine, Bull. Johns Hopkins Hospital, xvii, 201, December, 1907.

Money and Paget. Lancet, 1888, vol. i, p. 221.

Miwa. Jikwa Zasshi, 1900, No. xx.

Morris. Brit. Med. Jour., 1886, vol. ii, p. 1211.

Muhlberger. Zeitschr. f. klin. Med., 1905, vol. lvii, p. 374.

Murakami. Jikwa Zasshi, Tokyo, 1905, No. 65.

Murakami. Jikwa Zasshi, Tokyo, 1907, No. 81.

Murray. Annals of Surgery, 1903, vol. xxxviii, p. 736.

Mya. Lo Sperimentale Sex. Biolog., 1894, p. 215.

Navarro. Primera Reunión del Congr. Científico Latino-Americano, Buenos Aires, 1898.

Neter. Archiv. f. Kinderheilk., 1901, vol. xxxii, p. 232.

Neter. Münchener med. Wochensch., 1907, p. 1817.

Neugebauer. Archiv. f. klin. Chir., 1907, vol. lxxxiii, p. 503.

Nikolaysen. Norsk. Mag. f. Laegevid., 1900, p. 269.

Oestreich. Berl. klin. Wochensch., 1893, p. 852.

Osler. Johns Hopkins Hosp. Bull., 1893, vol. iv, p. 41.

Osler. Archiv. of Pediatrics, 1893, vol. x, p. 113.

Oulmont. Bull. de la Soc. Anat. de Paris, 1843, vol. xvii, p. 336.

Parry. Collections from the unpublished Medical Writings of the late C. H. Parry, London, 1825, vol. ii, p. 380.

Peacock. Trans. Path. Soc., 1872, vol. xxiii, p. 104.

Pennato. La Clinica Med. Ital., 1902, p. 13.

Perthes. Archiv. f. Chir., 1905, vol. lxxvii, p. 1.

Petrivalsky. Casop. lek. Cesk. v. Praze., 1907, vol. xlvi, p. 457.

Pfisterer. Jahrb. f. Kinderheilk., 1907, vol. lxv, p. 160.

Pippingskold. Finska lakaresalls kapetohandlingar, 1880, vol. xxii, p. 410.

Pitt. Trans. Path. Soc., 1895, vol. xlvi, p. 66.

Pluyette. Marseille Medicine, 1905, p. 241.

Polis and Roersch. Annales de la Soc. Med.-Chir. de Liege, 1893, vol. xxxii, p. 218.

Rampold. Wurttemb. Corresp-Blatt, 1847, vol. xvii, p. 35.

Rehn. Centralb. f. Chir., 1901, p. 1200

LeRoy des Barres. Gaz. des hop., July, 1903.

Revilloud. Gaz. des hop., 1877, No. 75.

Richardson. Trans. Amer. Surg. Assoc., 1897, vol. xv, p. 585.

Richardson. Boston Med. & Surg. Jour., 1901, vol. cxliv, p. 155.

Reider. Fortschr. a. d. Geb. d. Röntgenstrahlen, vol. viii.

Riether. Wiener klin. Wochensch., 1898, p. 77.

Rolleston and Howard. Trans. Clin. Soc., 1896, vol. xxix, p. 201.

Roser. Verhand. des 4th. Chir. Congress. Berlin, 1875, p. 3.

Rotch. Pediatrics, The Hygienic and Med. Treat. of Children, Philadelphia, 1896, p. 875.

Roth. Archiv. f. Clin. Chir., 1906, vol. lxxxi, p. 125.

Roux de Brignoles. Gaz. Med. de Paris, 1903, No. 40.

Schlange. Verhand. d. Deutsche Gesell. f. Chir., 1905, p. 165.

Sakamoto. Med. News (Japanese), 1907, No. 672.

Schreiber. Archiv. f. Verdauungs Frankheiten, 1907, vol. xiii, p. 101.

Schuckmann. Deutsch. Med. Wochenschr., 1907, vol. xxxiii, p. 127.

Schukowski. Med. Rundschau (Russian), 1903, H. 7.

Shiota. Med. News (Japanese), 1906, No. 716.

Silberberg. Centralb. f. d. Grenz. Med. u. Chir., 1903, vol. vi, p. 881.

Stewart. Archives pediatrics, 1900, vol. xvii.

Stirnimann. Corresp-Blatt f. Schweizer Aerzte, 1905, Sept. 15.

Tarozzi. Rifor. med., 1902, Nos. 188 and 189.

Tattel. Wiener Clin. Wochensch., 1901, p. 903.

Tordeus. Jour. de Clinique et de Therap. infantil, 1902, Nos. 188 and 189.

Treves. Lancet, 1898, vol. i, p. 276.

Treves. Intestinal Obstructions, N. Y., 1902, p. 242.

Torikata. Jikwa Zasshi, 1906, No. 75.

Tschernow. Jahrb. f. Kinderheilk., 1906, vol. lxiv, p. 811.

Valagussa. Rev. di Clin. Pediatric, Dec., 1903.

Van der Kolk. (Cited by Hurd.)

Vulpian. Gaz. des hop., 1877, No. 75, p. 593.

Walker and Griffiths. Brit. Med. Jour., 1893, vol. ii, p. 230.

Wallmann. Virchow's Archiv., vol. xiv, p. 202.

Walsh. Northwest Lancet, vol. xiii.

Walther. Bull. de la Soc. Anat. de Paris, 1888 p. 257.

Warashino. Jikwa Zasshi, 1904, No. 47.

White, Hale. Albutt's System of Med., vol. iii, p. 967.

Wilms. Münchener Med. Wochenschrf., 1905, p. 2061.

Woolmer. Brit. Med. Jour., 1899, vol. i, p. 1330.

Zenoni. Bull. della Assoc. Sanitar., Milanese, 1902, No. 6.

Zesas. Fortschritte der Med., 1906, No. 2.

SOME TECHNICAL POINTS IN THE CLEFT PALATE OPERATION,[1]

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THERE are not a few unsettled, and therefore debatable, points in the surgical management of those cases of cleft of the palate, in which the cleft is complete and extends through the alveolar process with single or double hare lip. Some of these points are unquestionably major ones, and others may be classed as potentially minor ones; but of these latter it must be acknowledged that any minor point may assume major importance in any given case, and count in a major way for or against the success of the surgical intervention. Therefore, all points are practically major matters.

It seems to me that I have, for myself, and for the present at any rate, argued out and settled some of these points, and it is to get a wider discussion of them than I can any longer get with myself that I offer them here.

The first of the major points is the selection of the type of operation; the time at which the operation should be done is inseparably included in this.

It is with some shamefacedness that I confess that I have never tried the Brophy operation, although the plan has been credited with many, almost incomparable successes. The reasons of my holding back are simple and several. I have rarely, if ever, found it an easy matter to bend, so that they would stay bent, or to break, the bones of the little infant's face. It takes not a little force to break the alveolar process so as to push into proper alignment the projecting intermaxillary bone, even after the palatal process and the vomer have been cut so that their parts may be made to overlap.

Moreover, and here is the point, the elasticity of the unbroken tissue is constantly exerted to reproduce the deformity of position. Long ago, when I first began to attempt this work, I used to bend this part forcibly into place and then put in silkworm gut sutures, through and through the bony plates, to hold the bent position. Under the elastic strain, the sutures invariably cut their way out and the effort was lost. Therefore, I have doubted that I could sufficiently forcibly press toward the middle plane the whole maxilla, when I had failed to so manage a part of it. If I could, in crushing the maxillæ together, *over*-correct — as I can do in the treatment of a club foot — so that the retention wires and lead plates should have but a minor strain on them, I would be in a different mood about the procedure. But as I cannot over-correct in the mouth, so as to extinguish the elastic tendency to the resumption of the deformed position, I have held back from the attempt. Mr. Edmund Owen, in writing of the Brophy plan, speaks lightly of the sloughs which form under the lead plates which hold against this elastic recoil of the maxillæ from the corrected position, while I have found that a slough in the mouth, where all toxin formed is absorbed or swallowed, is a dangerous thing in a little child. Still I have been impressed with the arguments for the Brophy plan of approximating the maxillæ, and I tried to adapt the idea to a technique which should avoid the trauma of a brisement, or a slough, or the necessary upsetting of the plane of the bones which the Brophy plan includes. In the winter and spring of 1906, I had in the Children's Hospital, in San Francisco, five or six of these little babies, on one of whom I tried this: I got Doctor Leander Van Orden to make vulcanite plates, one to fit on each half of the separated maxillæ. Each vulcanite half had a metal stem which came out of the corner of the mouth and was fastened by a tape to a little cap on the head. This served to keep the plates in place so that their outer flanges fitted fairly firmly along the outer sides of the alveolar processes. Between the vulcanite halves were stretched little rubber bands which tended to draw them together and with them the two maxillæ. The apparatus was intended to use the elastic bands to draw the maxillæ together, as dentists ordinarily use them to change the

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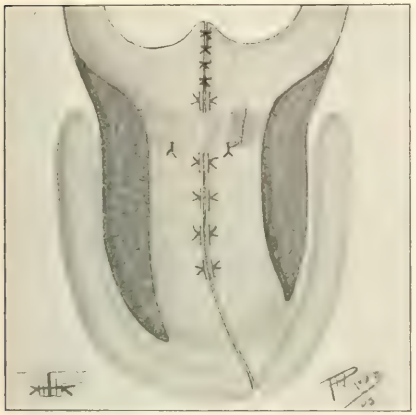

Note the waxed tape caught by two stitches on its anterior edge. The mucoperiosteal flap has been moved to the middle line and fastened to its mate by mattress stitches (see detail in the corner). The lateral incision is packed with iodoform gauze.

shape of the maxillæ or mandible in older children. The apparatus seemed to be well planned, it was most excellently made, but was a total failure because it proved to be impossible to keep the vulcanite plates properly in place in the maxillæ. The lips, as the child cried, or the tongue could displace them, and it was impossible to restrain these acts. Then, on this child, and also on the others, I passed a rubber cord,— a small rubber band — through the maxillæ, from side to side, above the palatal processes, just as Brophy does his silver wire. Along the outer side of each alveolar process, strips of hard rubber, softened in hot water, were carefully moulded. Through perforations in these hard rubber plates the rubber cord was led, a perforated shot was clamped on one side, the cord there was tightened a little and another shot was clamped on the other side to maintain the tension. This apparatus could not slip. I thought I adjusted each so that no trauma might occur and I confidently expected that I could, in a few weeks and without any injury to the child, draw the maxillæ together in the middle line and preserve the normal plane of the bones. But the mucosa has not the resistance of the bone, and I invariably got sloughs under the hard rubber plates, no matter how little tension I put on the rubber bands. In one or two instances, the rubber band having been made too tight, cut downward through palatal and alveolar processes and let the apparatus fall into the mouth. *In every instance I got an infected mouth.*

Just at this time, when I could see only failure ahead, the earthquake came along. The apparatus had to be taken out of the mouth of each child under treatment, for I could no longer take care of them. Some of these children we succeeded in getting back to their parents. Others died of gastrointestinal disorders, brought on by infected mouths and infected food, for we could get no milk and but little water and could not boil the water we did get. The whole plan ended as a miserable failure, and I write it down now only to complete the story of the attempt, and to explain why I personally shrink from the major act and traumatism of the Brophy plan.

I reverted now to the older operation, practically the Warren-Langenbeck operation, but I made some essential changes in important details. First: I kept the children out of the hospitals, or let them go to the hospital only for the operating room facilities, and made the mothers take them home immediately afterwards. From that time on the mothers did the nursing, or employed trained nurses to do it, in their homes. I did this because septic infection in the mouths had been the chief cause of the failures of permanent healing, and infection of the stitch-holes in the palate had been the obvious reason of the cutting out of stitches. In the hospital the child's open wound was exposed, either in the ward or in a private room, to all the different strains of all the ordinary pyogens. Infection was inevitable. At home, even though that home was a very poor one — and some of them, of course, were all of that — the child was exposed only to infections against which it had an inherited and also a developed immunity. The home environment was normal as against the abnormal hospital environment; and, even if my explanation of the phenomenon is not the correct one, the fact remains that the children whom I took care of in all kinds of houses did better than those whom I had kept in the

hospitals. Second: I selected a time for the operation which found the child sufficiently well nourished to stand the shock of the procedure, and to permit it to lose a small amount of blood without danger. It is impossible to do this operation without the loss of some blood, but the amount may be minimized by a fairly skillful man who is patient and painstaking.

Only twice have I seen acute anæmia and I know now that those particular children — a four months old infant on whom I did the palate operation, and a six months infant on whom I broke the alveolar process to correct the projection of the intermaxillary bone and then repaired the hare lip — were too young and too weak for the strain, though both survived it without special difficulty. But, not only must the child be well enough nourished to stand the strain, but it must also be well enough grown to offer proper tissues and a proper sized mouth. The *little* baby's tissues are too delicate, the *little* baby's mouth is too small to work in satisfactorily. On the other hand, waiting for these conditions must not be pushed beyond a very definite limit. Without having made special bacterioscopic tests to prove the fact, I am of the opinion that the advent of teeth increases the opportunity of infection in the child's mouth, inasmuch as it offers, in the wound of eruption and then around the crown of the tooth, abiding places for the ordinary mouth bacteria. Of course, delay beyond the period of infancy takes one into the time of adenoids and enlarged tonsils, and also of carious processes in the teeth. Finally, delay beyond the time at which the child learns to speak gives the child a bad tone and an imperfect articulation that are more difficult to correct after the palate has been repaired.

Therefore, I would formulate this rule as regards the much-discussed proper time for the palate operation. Operate as early as the child can stand the operation and can offer you properly developed tissues in a mouth that is not too small for the moderately easy doing of the operation. Operate, if possible, before the child has any teeth, and surely, unless there are insurmountable objections, operate before the child learns to speak. In most cases this will place the operation on the palate somewhere between the sixth and ninth months of life. Finally, I have found this time early enough to satisfy all the requirements which have not been already specifically taken account of.

What has, up to this point, been said refers to the work on the hard palate, as that is the major matter in the management of the case. The question of the time for the operation on the lip must now come up, though in time of operation the lip must precede the palate. This is necessary in order to permit the alveolar process and the intermaxillary bone to be broken and put into proper alignment, and the repaired lip to be used to hold them in place. This operation must be done one or two months before the palate operation, even though it necessitates doing the palate operation through the smaller orifice of the repaired mouth. But, at the most, only the posterior part of the palate operation can be done before the too prominent intermaxillary bone is put in proper alignment, and the association of this act with the repair of the lip is such, in my mind, that they must be done at the same time. Moreover, the pull of the repaired lip is quite rightly, I think, credited with narrowing the cleft of the palate, and this is a thing to be definitely desired in many instances. Therefore, for the very sake of getting a palate on which an adequate palate operation can be done, the malposition of the intermaxillary bone must be corrected and the operation upon the hare lip must be done. In comparison with this consideration, the fact that the palate operation has to be done through the smaller opening of the repaired mouth is a mere matter of manipulative dexterity.

That this is one of the difficult operations to do I think we will all acknowledge, but up to the past year and a half it has been with me an operation much easier in the doing than in getting satisfactory healing. My experience has been the common experience of all, and I have had to see many a good palate fall apart because the stitches tore out through the posterior half or two-thirds of the suture line. Primarily too much tension, perhaps, and secondarily stitch-hole infection, surely, are the easily understood causes, but there was another cause, which was operation.

All the operators whose work I have seen, and all writers who have described or pictured the suture have made it a plain, through and through, interrupted stitch. This brings together in the middle the thin edges of the cut mucosa and periosteum on each side and offers very little surface of contact for union; and, even when union has taken place, the healing line is so thin that it easily succumbs to the infection which is on both sides of it, in the nose and in the mouth.

In order to improve this detail, I have, for the last two years, been mattressing my sutures and so getting broader surfaces of contact for the primary union. This has been a distinct advantage and it has given me, also, in the final result, greater thickness and strength in just the place where the old result was thin and weak. Still it is not an unmixed good, in the first instance, for it takes up more tissue than does the old way and so puts more tension on the tissues in the bight of the stitches, but this objection I have learned to overcome, and so have eliminated the disadvantage. C. H. Mayo showed us how to put tape or a strand of gauze around both flaps, and through nose and mouth, to drain the nasal cavities and to fortify the stitches. In the use of this I found, however, that tape or gauze quickly became saturated with saliva and mucus and a veritable hotbed for the growth and dissemination of all infective mouth organisms. To obviate this and keep the tape — I did not try it with gauze — from fomenting infection, I saturated it with wax and iodine, using the formula suggested by James E. Moore as a substitute for the original Moorhoff bone wax. In doing the operation, the sutures are put in place and tied, and I like to make a knot on each side of the suture line, so as to be sure to have a loose end to pick up when the time has come to remove the stitches. Then the end of a waxed tape is carried, by an ordinary ligature carrier, around both flaps as far back as is the junction of the hard and soft palates. In this location, which is where the greatest strain will come and where the suture line first breaks down, it is caught at proper tension by a hæmostat, and then by two or three sutures through the overlapped ends, after which the hæmostat is removed. In this place the tape plays the part of a relaxing suture and the mattress sutures are coaptation stitches, and the combination is most satisfactory. For the mattress sutures I invariably use silkworm gut in the palate and horsehair in the uvula; they and the waxed tape are immaculately clean and in a clean mouth all tell for primary union and the rule is to get primary union from end to end of the suture line. The tape stays in place seven or eight days, the silkworm gut four or six days longer. The firmness of the line of union is shown by the turned down edges of the flaps which may make a little anteroposterior ridge along the center of the palate.

I usually pack into the lateral releasing incisions some five per cent iodoform gauze; the first packing is permitted to stay two or three days, after that it is changed daily. This I do myself. The gauze serves as a splint or support for the flaps, separates the mouth from the nose, and the iodoform seems to control saprophytic action. At any rate, it is a cleanly device and does not permit too early union of the lateral releasing incisions with coincident increase of the pull on the silkworm sutures.

Since I have been using this combination of the mattress stitch, which stays in place twelve to fourteen days, the waxed tape, which is untouched seven to eight days, and the iodoform gauze packing, changed each day, I have been able to dispense with all but the simplest plans of cleaning the mouth. I have the mother or nurse spray the mouth and nose with simple salt solution after each feeding, and salt solution I prefer to any of the favorite formulæ of the nose and throat practitioners. I wish to wash away only an excess of normal mucus, not the thick, dry mucus of an old inflamed mucosa. In the infant's mouth the Dobell's Solution type of application leaves the mucosa bare, it seems to me, and so stimulates some hypersecretion. The simple salt solution is less irritating and much to be preferred.

The method of feeding is a minor point with a major value. To expect a child to swallow comfortably with a catgut and waxed tape in the roof of the mouth is expecting a great deal, and, even if they could, there would be not a little unswallowed residue left in the mouth, around the stitches and tape, as breeding places for mouth organisms. To avoid this,

I used to withhold food by the mouth for a few days, feeding by the rectum instead, but I quickly found that this was an incompetent method, for the child could not get enough food to enable it to undertake the extensive reparative processes necessary to mend the palate.

Lately I have been feeding these children by the catheter through the nose and it works most admirably. The children are necessarily bottle fed, and after the operation I have poured into their stomachs, by funnel and catheter, the usual amount of their customary formula or milk mixture, and at the usual feeding intervals. The children, even those who are old enough to at first protest, quickly learn to accept the innovation and I can, therefore, get in a proper amount of suitable food without its invading or soiling the mouth. Surely slipping a sterile catheter, anointed with sterile vaseline, through the nose is a cleaner act than spoon feeding milk into a mouth where are extensive wounds, and, in addition to its cleanliness, it avoids all, or almost all strain upon the sutures, for the strain made by crying is nothing to the strain caused by the act of swallowing. And I have often seen these infants stop their crying so soon as the catheter was in place and the food began to reach the stomach, while the children who have to swallow their food have necessarily continuous successive pulls upon the stitches until the meal is ended. There is one danger, it is very easy to overfeed, for the child cannot say when it has had enough. Therefore, it is important, to gauge the amount poured in by the catheter by the amount the child had been in the habit of taking before the operation, and not increasing this amount except by the smallest proportion, unless the child very plainly indicates, by crying for food before the proper interval has elapsed, that it has not had enough at the last feeding.

To summarize: Operate upon the palate as soon as the child is old enough to stand the shock of the operation and the loss of a little blood, and has sufficiently developed tissues to hold sutures and not too small a mouth.

Operate, if possible, before the eruption of teeth, and surely before the child begins to speak.

Suture the mucoperiosteal flaps with silkworm gut mattress sutures, the uvula with horsehair. Put a tape, saturated with an iodized wax, around both flaps as a relaxing suture. Let it surround the flaps at the point where the hard and soft palates join. Pack the lateral incisions with iodoform gauze.

Operate upon the hare lip about two months before you do the operation on the palate, and, at the time of the hare lip operation, cut the vomer and the palatal process, and break the alveolar process at the proper place to permit the pressing of the projecting intermaxillary bone into alignment, so as to make the curve of the alveolar arch symmetric.

After both the hare lip operation and the operation on the palate, feed the child by means of a funnel and a catheter passed through the nose. Be careful, in this method, to give not too much, but just enough.

Cleanse the mouth and the nose with simple salt solution spray after each feeding.

FURTHER EVIDENCE IN SUPPORT OF THE THEORY THAT HODGKIN'S DISEASE IS A TYPE OF SARCOMA[1]

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TWO years ago, in a paper read before the Southern Surgical and Gynecological Society, I reported a series of cases of Hodgkin's disease, observed in connection with upwards of seventy cases of sarcoma originating in the lymphatic glands. This small group of tumors, designated as Hodgkin's disease or pseudoleukæmia, have certain definite clinical and histological characteristics sufficient to differentiate them from other tumors of the lymphatic glands, e. g., tuberculosis and the ordinary types of sarcoma. However, a closer study both clinical, microsopical, and anatomical, furnishes strong evidence that the process we are dealing with is a neoplastic one, so similar to sarcoma as to be properly classified as a variety or type of the latter.

I have, up to the present time, observed upwards of eighty cases of sarcoma of the lymphatic glands. Many of these cases so closely simulated Hodgkin's disease, that it was difficult to distinguish the two conditions. In some cases the clinical appearance was like that of an ordinary sarcoma, several examples of which were cited in detail in my former paper,[1] yet the microscopical examination showed a picture which the pathologists who had made a most careful study of Hodgkin's disease, pronounced absolutely typical of pseudoleukæmia.

Again, I have observed a tumor starting in the supraclavicular region, involving both cervical and axillary regions as, also, both groins, later invading practically all of the mesenteric and retroperitoneal glands; in other words, forming a typical clinical picture of Hodgkin's disease; and yet, the same pathologists pronounced the tumors round-celled sarcoma.

The pathological and clinical pictures of Hodgkin's disease have already been fully presented by Dorothy Reed (1), Longcope (8), and others.

The main points of pathological significance are described as enlargement of lymph glands; absence of infiltration of the capsule; grayish surface, broken by intersecting yellowish lines; metastases in the viscera presenting a similar appearance, though of irregular outline and apparently invading the organ in different directions. On section, they present the same appearance as described in the glands. On microscopical examination, there is found dilatation of the blood-vessels, and lymph sinuses, marked increase in lymphocytes and proliferating endothelial cells, numerous giant cells with one or more nuclei and prominent nucleoli appear in a great number; occasionally a very large giant cell with many small nuclei, peripherally arranged, is seen. An increased number of eosinophiles is generally observed. Reed states that the capsules of the glands usually show no change, except, possibly, some thickening. This, however, is not borne out by other writers, especially by Gibbons in his recent work. Careful autopsy studies were made in five of his cases, while in Johns Hopkins Hospital the material was limited to three autopsies only.

The large giant cells are the most striking feature of the sections from Hodgkin's disease tumors. Reed states that they occur in great numbers in the large lymph sinuses of the glands, and occasionally are seen in the blood-vessels. They vary remarkably in size, from two to three times the size of a red blood corpuscle to twenty times its size. Sometimes as many as eight to ten nuclei are seen in a single cell. Large numbers of eosinophiles were observed in all but two of Reed's cases.

The clinical picture of Hodgkin's disease is as follows: It almost always begins in the glands of the neck, may occur at almost any period of life, but is more commonly seen at

[1] N. Y. Med. Jour., March 30, 1907.

[1] Read before the American Surgical Association, May 5, 1908.

an early age, and is more frequent in the male than in the female sex. A tuberculous family history is rarely found. The glands begin to enlarge on one side first; very quickly enlargement is noticed on the other side also; a little later the axillary glands are affected, and finally, the inguinal glands also. These enlarged glands differ clinically from both ordinary sarcoma of the lymphatic glands and tuberculous adenitis. On palpation, they show much greater mobility than is seen in ordinary sarcoma or tuberculous glands, giving the sense of a discrete, independent nodule. The skin is not affected; the glands move freely upon the deeper parts. There is entire absence of the "fusing together" in these independent masses, so commonly found in tuberculous adenitis. Neither is there any tendency to breaking down or caseation. Later on, anæmia develops without any particular increase in leucocytes. The spleen is often markedly enlarged, and in the later stages, also the liver, and marked cachexia appears. In some cases the spleen exends nearly down to the brim of the pelvis (see illustration).

Reed's careful and most thorough work has, in the minds of most investigators, entirely disproved the theory of the tuberculous origin of Hodgkin's disease; yet, there are a small number who still cling to the tubercular theory, or, at least, believe that it cannot be entirely set aside.

One of the most recent papers dealing with this question, is that of La Roy and Gand (9). La Roy has made a very careful histological study of seven cases of Hodgkin's disease. His conclusions based upon this study are, that under the names of pseudoleukæmia and Hodgkin's disease, two distinct diseases are confounded. Pseudoleukæmia or Hodgkin's disease, differs from lymphatic leukæmia only in the blood picture of the two diseases. On the other hand, there is a chronic affection of multiple glands, probably of tuberculous origin, that more or less closely simulates true Hodgkin's disease or lymphatic leukæmia. These two groups of tumors, in the opinion of La Roy, differ in several material points. In the tuberculous variety, leucocytosis is more apt to be present, while in Hodgkin's disease, there is a lymphocytosis. Fever is much more likely to be present in the tuberculous variety, than in Hodgkin's disease. Still further, there is a decided difference in the two groups in the manner in which they are influenced by the X-ray, the tuberculous type showing very slight changes under X-ray treatment, while the lymphatic and splenic enlargements seen in Hodgkin's disease often disappear or diminish strikingly under X-ray treatment. Still further, there is marked tendency to hæmorrhages in Hodgkin's disease, which is very slight in the tubercular type. La Roy holds that pseudoleukæmia is practically identical with leukæmia. This is the view already expressed by Banti, professor of pathology in Florence (Italy).

Finally, and most recently, Stengel and Pancoast (10), in their article on the treatment of leukæmia, add further authority to this view. They conclude: "Regarding the nature of the process it is impossible to dogmatize. Our own opinion, expressed in other places, has, for a long time, inclined us to believe that the disease is closely related to neoplastic processes. There is an undoubted close connection between certain sarcomata and leukæmia. The histologic features, the progress of the disease, the metastases, and the clinical analogies suggested by cases of undoubted sarcoma, tend to confirm this opinion."

In both the lymphatic and myelogenous types, Stengel believes that the trend of recent opinion is in the direction of proliferation of metastatic cells in the organs in which they have been deposited.

Those, on the other hand, who believe in the infectious theory, regard the tumors of Hodgkin's disease and leukæmia, not as true metastases, but rather as local leucocytosis, due to chemotactic influence of some kind, or due to some unknown cause.

Neumann holds to the neoplastic nature of both leukæmia and pseudoleukæmia and he states that if the pathological stimulus to proliferation falls first, or alone, upon the spleen and lymphatic glands, then we have, as a result, pseudoleukæmia; while, if this stimulus falls in like manner upon bone marrow, we have leukæmia.

There is a strong tendency, at present, to regard leukæmia of both types as primary

in the bone marrow, and this opinion has been very strongly supported by Stengel and Pancoast.

Banti, professor of pathologic anatomy at the University of Florence, who has for many years made a very careful study of leukæmia and pseudoleukæmia, is firmly convinced that both are of a sarcomatous nature. The principal grounds upon which he bases his conclusions are the following reasons why enlargement of glands, spleen, etc, are not simply hyperplasia of normal lymphatic tissue:

1. The lymphadenoid tissue is often atypical.

2. The lymphadenoid tissue regularly invades the trabeculæ, frequently, also, the capsules of the lymphatic glands; even breaking through the borders of the glands and invading adjacent tissues.

3. The walls of the blood-vessels, especially the veins, are constantly invaded.

4. The frequent occurrence of hæmatogenous metastases.

5. The rarefication of the bone due to erosion of the new-formed tissue.

Banti, furthermore, states "the name of 'hyperplastic' should not be conferred on a tissue with atypical structure, which shows a tendency to invade neighboring tissues and gives rise to metastases. Such a tissue should be spoken of as neoplastic rather than hyperplastic."

In myelogenous leukæmia the reasons for regarding the disease as sarcoma are even stronger. Here Banti states:

"1. The myeloid tissue, both primary and secondary foci, has always a more or less atypical structure as compared with normal bone-marrow.

"2. The myeloid tissue invades the blood-vessel walls, particularly of the veins, and comes in direct contact with the blood by destroying the endothelium. The presence of blood-channels without walls is characteristic of sarcoma.

"3. The myeloid cells produce hæmotegenous and lymphogenous metastases, just as do the cells of malignant neoplasms.

"4. The metastatic nodules, as in cancer, are produced by proliferation of important specific cells; the elements of the organs involved take no part in their formation.

"5. The periosteum and surrounding tissues may be involved by the extension of myeloid tissue from the bones."

Among the objections to the neoplastic origin of Hodgkin's disease and leukæmia are, that they show so many features pointing toward an infectious origin, which, with the majority of pathologists, is sufficient to exclude them from the class of true neoplasms. Furthermore, it has been assumed that the tumors of Hodgkin's disease invade only preexisting lymph gland tissue and that they never infiltrate the capsule or overlying structures. While this is probably true in the majority of instances, there are certain important exceptions, as shown by the case reported by Gibbons[1] two years ago, and one of the case which I shall relate in the present paper.

Case I. *Sarcoma of the Inguinal Glands, Simulating Hodgkin's Disease.* H. M., 37 years, was admitted to the General Memorial Hospital on August 24, 1906. The patient was referred to me by Dr. A. G. Gerster as a case of inoperable sarcoma. Family history negative. The patient stated that he had always been in good health. Three years ago, he first noticed a small swelling in the right groin. This grew slowly until it reached the size of a walnut, was never painful, general health remaining perfect. Five months prior to his admission, the lumps in the groin began to increase in number and to grow rapidly in size. They finally interfered with his walking.

Physical examination at the time of his entrance to the hospital showed heart and lungs normal. His right inguinal region is occupied by a number of independent tumors, more or less closely fused and extended deeply into the iliac fossa. The skin over the growths was freely movable. The right thigh and leg were considerably swollen. Inasmuch as the tumor mass seemed so unusually movable, it was deemed wise to attempt removal. This was done by my associate, Dr. Downes, on September 4, 1906. An incision, nine inches long, was made from the anterior superior sp., passing over the middle of Poupart's ligament and down along the course of the femoral vessels, and a very large number of nodules, varying in size from a marble to a lemon, all more or less completely surrounded by a capsule, were removed. The peritoneum was opened accidentally in one place and closed with catgut sutures. The wound healed satisfactorily, without suppuration. Microscopical examination of the growth, made by Dr. Clark, assistant pathologist of the hospital, and confirmed by Dr. Wood of the College of Physicians and Surgeons' Laboratory, pronounced it Hodgkin's disease. Portions of the tumor were also examined at Cornell Laboratory, and the same diagnosis was made. Blood examination on May 7 showed:

[1] Amer. Jour. Med. Science, 1905.

Red cells, 4,200,000; white cells, 51,000; polymorphous 35 per cent; lymphocytes, 65 per cent; hæmoglobin, 80 per cent.

After the wound was healed, the nucleoproteid serum from a case of Hodgkin's disease, prepared by Dr. S. P. Beebe from the Huntington Laboratory Fund for Cancer Research, was begun. Nine tubes of 15 c.c. each were given without apparent effect. October 16th the serum was given up and the patient was put upon the mixed toxins of erysipelas and bacillus prodigiosus.

There was some slight improvement under the toxin treatment which, however, did not last. The blood examinations made during November and December, showed the following:

Red blood cells	Hæmoglobin	White blood cells	Polymorphonuclear cells	Lymphocytes
4,000,000	75	34,800	64	34
3,800,000	75	38,000	55	45
3,600,000	70	56,000	60	40
3,400,000	65	56,000	65	35

The patient continued to fail markedly, and after leaving the General Memorial Hospital, he entered the King's County Hospital, where he died three months later. The autopsy records of the case, which have been kindly furnished me by Dr. Lawson, of the staff, add very greatly to the interest of the case; they strongly emphasize the striking similarity between Hodgkin's disease and sarcoma.

Autopsy Report. Body of a large, stout man, moderately nourished; skin shows a faint, livid color; numerous flat nodules of about the size of a ten cent piece up to one quarter, chiefly on the abdomen and thighs. One of them in the right side of the abdomen has been excised. General anasarca of the lower parts of the body, especially marked in the skin of the thigh and legs where part of the epidermis has been raised, forming vesicles which contain serous fluid.

Pericardial cavity contains about a tablespoonful of serous fluid. Heart corresponds in size to the fist of the body. Left ventricle slightly dilated, thickness of its wall about 1 cm., of the right ventricle about 1 cm. Valvular apparatus shows no lesions. Through all yellowish patches, and streaks within the intima of the ascending aorta.

Lungs. Right lung shows hypostasis of the inferior lobe, with foci of lobular infiltration and œdema of the upper and middle lobe. The right pleural cavity contains about 300 c.c. of a yellowish, slightly turbid, serous fluid, which contains fibroid coagula floating within the fluid part adhering to the lusterless pleura pulmonalis. Left pleural cavity free, contains no fluid; left lung shows hypostasis in the inferior and œdema of the upper lobes.

The peritracheal and peribroncheal glands are enlarged about the size of a walnut, the cut surface a grayish white color of homogenous appearance, lying between fine, whitish streaks of fibroid texture. Mediastinal space free.

The abdominal cavity contains no excess of fluid. Intestines apparently normal. After their removal an extensive tumor mass can be seen bulging on either side of the vertebral column, and beginning about at the level of the last dorsal vertebra and descending on either side towards the groin. This mass of tumor involves the whole of the iliopsoas muscle on either side, and becomes continuous with the periosteum of the vertebral bodies, corresponding to the origin of that muscle, so that its separation from the vertebral bodies is very difficult, and could be done only artificially by the use of the knife.

A wedge cut out of the bodies of the second and third lumbar vertebræ, shows on the cut surface that the periosteum which can be traced, otherwise, partially becomes lost in the tumor mass, which can be traced extending into the spongeous substance of the vertebræ in form of yellowish-whitish streaks and patches.

The whole tumor mass extends in one process on either side, toward the groin, following the course of iliopsoas muscle, and enters the triangle of Scarna beneath the groin, extensively involving the skin and tightly adherent to it. After its removal, it shows about the size of a man's head. The cut surface shows that the iliac muscle, the fibers of which are distinctly separated, has been penetrated by a grayish white tissue which appears between the bundles of muscle as nodules and grayish patches, and can be directly traced to the underlying retroperitoneal glands, the cut surface of which shows the same appearance, which has been described in mentioning the peritracheal glands. The size of these glands, which, closely packed together, form the interior of the tumor mass, varies from the size of a walnut to half an apple.

Spleen slightly enlarged, soft, capsule folded. Pulp shows dark red spots of small size, apparently hæmorrhagic, changes with lighter colored areas. Malpighian bodies not distinctly visible.

Left kidney apparently normal in size, shows slight fœtal lobulation, contains a moderate amount of blood. Capsule strips easily. Cortex slightly narrowed. The differentiation of the parenchyma in the cortex and medullary substance is not distinctly marked, streaks of lighter colored tissue appear as well in the cortex as in the medulla; chiefly in the latter and between the pyramidal columnæ. Kidney pelvis slightly dilated, as well at the beginning of the ureters. Right kidney, like the left, can only with difficulty be separated from the above-mentioned tumor mass, which embraces its lower pole and extends along the inner border of the kidney, with a process toward the hilus. The pelvis is slightly more dilated than that of the left kidney. The appearance of the cortex and medullary substance is about the same as in the left kidney, only the medullary substance appears more narrow.

Liver shows a smooth, glistening surface, is normal in size, slightly congested, cut surface of a mottled appearance.

CASE 2. *Hodgkin's disease — clinical diagnosis confirmed by microscopical examination. Entire disappearance of lymphatic and splenic enlargement under two months' treatment with the mixed toxins of erysipelas and bacillus prodigiosus, without other treatment. Patient perfectly well at present — seven months later.* G. K., 24 years, negative family history. In October,

1906, first noticed enlargement in the glands on the right side of the neck. The swelling was, at first, confined to one gland; later a number of neighboring glands became involved, until the entire chain from the mastoid to the clavicle were affected. There was only slight enlargement on the other side. About six months later, a similar enlargement in the axillary and both inguinal regions became apparent. His general health began to fail and he lost 20 pounds in weight. The patient was admitted to the General Memorial Hospital on October 10, 1907, at which time he weighed 165 pounds. Physical examination, on admission, showed a tumor mass occupying the whole right cervical region, from mastoid to clavicle and from the median line in front to nearly the median line behind. The tumor is made up of nodules varying in size from a hazelnut to an English walnut, more or less discrete, but loosely attached to one another, as well as the underlying and overlying structures. Examination of the axillæ showed similar enlargement of the glands on both sides, the largest being the size of an egg. Both groins were, also, occupied by similar glandular tumors, the largest being the size of an English walnut. The spleen shows marked enlargement, extending about two inches below the costal arch; liver slightly enlarged. Blood count showed the following (October 11):

Leucocytes	4,050
R. B. C.	4,070,000
Polynuclear	62%
Lge. Lymphoctyes	18%
Sml. Lymphocytes	17%
Transitionals	3%

The clinical diagnosis of Hodgkin's disease was made by Dr. W. K. Draper, who saw the case before the treatment was begun. The patient was immediately put upon the mixed toxins of erysipelas and bacillus prodigiosus, without other treatment. Systemic treatment only was given, all injections being made into the pectoral region. The patient showed an extraordinary susceptibility to the toxins. The initial dose of ¼ m.m. was gradually increased to 1½ m.m. which latter dose produced a temperature of 105.6°. Up to November 15, he had received fourteen injections. At the end of two weeks the tumors in the axillary and inguinal regions had almost entirely disappeared; the spleen had diminished in size so that it was hardly palpable; the neck tumors had decreased two-thirds. At the end of this time one of the glands, about the size of a hickory nut, was removed and examined by Dr. W. C. Clark, the pathologist of the General Memorial Hospital, and by Dr. Jas. Ewing, professor of pathology at Cornell Laboratory. Both pronounced it typical Hodgkin's disease of the giant-celled type. At the end of two weeks, the patient developed toxæmia and ran a temperature of 102.3°, nearly every day for upwards of a week, during which time the treatment was suspended. After the attack had subsided, the injections were resumed in smaller doses. November 20, or about five weeks from the time of his admission to the hospital, all tumors had disappeared. The treatment was continued to the end of November. The patient was so exceedingly susceptible and so profoundly prostrated by even small doses of the toxins, that he was seldom able to take more than two or three injections a week. He suffered from very severe general muscular pains, particularly localizied in the lumbar region. Toward the end of November the cervical tumors showed very slight increase in size and the dose of the toxins was again increased. The patient then left the hospital for a few days rest, but did not return. I had lost sight of him up to two days ago, when my assistant, Dr. D. H. M. Gillespie, succeeded in tracing him. He found him in perfect health; he had gained 40 pounds in weight and had resumed his work. Careful examination revealed no swelling in the axilla or inguinal regions and no enlargement of either spleen or liver. The patient stated that his local physician had given him some medicines, the nature of which he was unable to ascertain.

The further blood examinations in this case showed the following:

Oct. 26, 1907, lencocytes 12,000, red cells 4,440,000, polynuclears 84 per cent, large lymphocytes 7 per cent, small lymphocytes 8 per cent; November 1, 1907, lencocytes 4,020, red cells 4,410,000, polynuclears 81 per cent, large lymphocytes 3 per cent, small lymphocytes 15 per cent.

For the report of the following case of Hodgkin's disease, which was treated with the mixed toxins, under my direction, at the Roosevelt Hospital, I am greatly indebted to Dr. Walter B. James, attending physician to the hospital and Dr. Hodenpyl, the pathologist.

Case 3. J. S., male, aged 8 years, was admitted to Roosevelt Hospital October 28, 1905 (transferred from 2d. surgical to medical division), with the following history: Father and mother living and healthy. P. H.:

Sixth child, the others all living and well. No tubercular or rheumatic history obtainable. Patient had measles seven years ago. The present illness started when he was 1½ years old; a small lump noticed in the neck behind the left ear. This grew steadily and other similar tumors appeared three years ago, when the patient was 5 years of age. Several of these were removed in Europe, only one remaining behind the left clavicle. Two months after this, the glands again began to increase in size and have shown steady enlargement ever since. There is no impairment in respiration. General health good. Re-admitted to the hospital October 24, 1907; then 10 years of age. The glands have steadily increased in size since his previous stay in the hospital two years ago. Temperature 100.6°, pulse, 108, respiration 20. Measurements of the glands in the cervical region: 4⅜ inches vertically, and 4¾ inches transversely. The left inguinal glands were similarly enlarged, measuring 3½ x 4¼ inches.

The patient did not show the appearance of serious illness. He was undersized, fairly well nourished; face full; made fuller by a large tumor mass under the left jaw and encroaching upon the face. The legs were very small; he limped with his left foot; color, normal; cheeks red; lips not anæmic; pupils equal and react to light; ears normal; tongue moist; throat clear; mouth, in fair condition. Heart, seemingly normal in size and in normal position; heart action regular; pulse regular, normal rate. Lungs are difficult of examination, because tumor masses cover left apex, scapular region and upper axilla. Right chest seems normal to percussion, palpation and auscultation. Over the left chest, in the region of the apex, and in front over the first and second interspace, and behind, in the left portion of interscapular space, the breathing sounds are diminished through vesiculas. The note seems dull and the tumor masses add to the thickness of the chest wall. Voice is fuller and more nasal than on the opposite side; fremitus diminished. Abdomen prominent, pot-bellied, soft, tympanitic. No tenderness; no masses felt on deep palpation. Liver shows increased dullness and edge is felt below the costal margin. Spleen is also slightly enlarged. In the left groin there is a swelling about 2½ x 3 inches, extending to Poupart's ligament above and inwards to inner side of thigh. The tumor is made up of large, irregular masses, which feel like enlarged glands, tender to pressure, showing no fluctuation, unattached to skin, loosely attached to deeper parts. Leg is held in position of some flexion; extension possible, but somewhat painful.

On the under side of the left jaw, extending up over the jaw on face in front of and behind ear and downwards to middle of neck, there are similar masses the sire of an orange. In the left axilla there is a mass the size of a tennis ball; the skin over it is reddened. There are also simliar masses 3½ x 2½ inches behind and to the inner side of the left clavicle. Numerous smaller masses are found in the lower cervical region on the left side and over the shoulder in front and behind, giving the shoulder a padded appearance. There are, also, similar masses in the right knee. Other smaller masses more discrete, over the right neck region, the size of walnuts. A few discrete glands are found in the right axilla. The right groin is free; epitrochleas not enlarged.

In general the swellings are irregular in contour, and the skin is normal. They are irregular to touch, persenting hard masses, some large, others small; the larger, from the size of a walnut to that of an egg, seem composed of smaller masses joined together. The smaller, are rather hard, well-defined, movable on the deeper parts; the larger are attached to the deeper parts. The masses in the left groin and left axilla are tender; the others very slightly tender. No fluctuation is obtained, but the masses in the left axilla feel softer than others. Some seem attached to the skin, except the large mass in the left neck around the jaw. It there presents a transverse scar about 2½ inches long (the site of the former operation). The skin shows many dilated veins over the upper and outer part of the left chest.

The injections with the mixed toxins were begun on November 8, the initial dose given being ¼ m.m. This was gradually increased up to the point of getting a moderate reaction, a temperature of 102.4°. The injections were all systemic. At this time the patient had been in the hospital about two weeks. The disease was steadily progressing, and very little effect was observed from the treatment; no marked diminution in size occurred. The patient's general condition continued to decline, and, on my advice, the toxins were discontinued on the 24th of December. The boy died on the 25th of January, 1908. Autopsy, made by Dr. Hodenpyl, pathologist to the hospital, showed the following:

Body emaciated, showing numerous glandular masses. Neck enlarged to ½ greater diameter than head by glands in submaxillary region. Right axilla not involved. Left shows mass size of large orange with 2 ulcers size of 25-cent piece. Large mass, size and shape of adult heart in left inguinal region. Right not involved. Head of left tibia shows a mass the size of a walnut. Right leg very slightly œdematous; left markedly. Lungs, liver, kidneys, spleen, pancreas, heart, and intestinal tract not involved; left lung adherent posteriorly at the base; pericardium adherent throughout; large mass of glands, size of grape fruit, involving sternum at upper portion, projecting anteriorly and posteriorly into mediastinum; double chain of glands down entire length of spine.

Abdomen. Purulent peritonitis in lower part, especially on right side, mesentery lower and small glands. Pelvis filled with mass of glands continuous with large mass in left iliac fossa and, through latter, with mass in inguinal region. All larger glands broken down to

greater or less extent. Smaller glands show areas of necrosis suggestive of T. B. C.

Anatomical diagnosis. A very careful microscopical examination was made by Dr. Eugene Hodenpyl, who pronounced it Hodgkin's Disease. He states that the microscopical examination of the lymph nodes showed fairly well the characteristic lesions of Hodgkin's disease of a rather chronic, i. e., fibrous type. Many of the larger nodes were infected and broken down; some showed necrotic areas, which were carefully stained for tubercle bacilli but with negative result. Two pigs were inoculated, also with negative result. There was no involvement of any of the viscera including the gastrointestinal tract.

CASE 4. C. T., aged 21 years; F. H., negative, except that two maternal aunts had died of tuberculosis. P. H., had ordinary diseases of childhood, diphtheria and pneumonia when 5 years of age; the latter again when 15 years of age. The patient drank considerably for two years; stopped a few months ago. No venereal history. In 1905, he first noticed an enlargement of the glands on the right side of the neck, which were removed by Dr. W. L. Huggins, of Los Angeles, in February, 1906. The glands were found encapsulated, more or less discrete, without evidence of caseous degeneration. Blood examination, made by Dr. J. N. VanderVeer, showed:

Hæmoglobin	85%
Leucocytes	7,450
Reds	6,720,000
Lge. Mononuclear	4%
Sml. Mononuclear	10%
Polynuclears	70%
Transitionals	4%
Eosinophiles	12%

The trouble recurred, and in February, 1907, Dr. Huggins performed a second operation, which was again followed by recurrence. No microscopical examination was held.

On September 15, 1907, the patient was referred to me for an opinion. At this time the right cervical region was occupied by a tumor made up of several distinct nodular masses, the largest the size of a goose egg, more or less discrete, freely movable upon the deep parts, not attached to the skin.

I made a clinical diagnosis of Hodgkin's disease, and advised a trial with the mixed toxins of erysipelas and bacillus prodigiosus. For a time there was considerable general improvement as also marked decrease in the the size of the tumor masses, but this proved only temporary. The X-rays were then tried for several months, but in spite of the treatment, the neck tumor as well as the glands in the axilla increased in size. The patient was then referred to Dr. A. W. Elting, of Albany, who, early in February, 1908, performed an extensive dissection on the right side of the neck, removing all of the diseased tissue with exception of the submaxillary triangle and right axilla. Two weeks later the submaxillary triangle and right axilla were cleaned out. He made a good recovery from these operations. The specimens removed at both operations were carefully examined at the Bender Laboratory and pronounced typical Hodgkin's disease.

The close relationship of Hodgkin's disease and leukæmia to sarcoma is further evidenced by the similar action exerted upon these conditions by the X-rays and toxins, as demonstrated by the following briefly reported case, for the data of which I am indebted to Dr. J. F. Lyon.

CASE 5. Mrs. D. K., came under the care of Dr. Lyon, February 10, 1907, for the treatment of glandular and splenic leukæmia. The glands of neck, axilla, and groin were much enlarged. Spleen and liver extended three or four inches below the ribs. The patient was sent to Dr. W. J. Morton, February 11, 1907, for X-ray treatment which was carried out, with occasional intervals of rest, for a period of ten months. The first blood count, made by Dr. M. A. Mason, of this city, was as follows:

February 12, reds 2,800,000, whites 98,000, hæmoglobin 45 per cent.

Subsequent blood examinations made by Dr. H. T. Brooks, pathologist to the N. Y. Post-graduate Hospital, while the patient was under the X-ray treatment, showed the following:

	Reds	Whites	Hæmoglobin
February 23	2,029,000	484,000	40%
March 30	2,215,000	630,000	45%
May 21	2,537,000	630,000	45%

In the latter part of May, 1907, the patient developed an attack of erysipelas, and the marked and rapid improvement which occurred thereafter, suggested to Dr. Lyon the possibility of further improvment under the mixed toxins. I saw this case in consultation on September 12, 1907. The patient, at this time, was considerably jaundiced; the spleen was markedly enlarged. The cervical, axillary, and inguinal regions were occupied by large, glandular masses, the condition found presenting the typical picture of Hodgkin's disease. The mixed toxins of erysipelas and bacillus prodigiosus were begun and the dose gradually increased from $\frac{1}{4}$ to 3 m. m., which dose produced a chill and temperature of 103.4°. At the end of about three weeks' treatment, the blood count showed a reduction in the number of leucocytes by more than 100,000, and also a decided reduction in the size of all the glands. In January, 1908, the patient developed a second very severe attack of erysipelas to which, at the end of nearly three weeks, she succumbed.

In connection with the foregoing cases, the two cases of leukæmia reported by Dr. Ralph C. Larrabee[1], in which he used the mixed toxins, may be of interest.

[1] Boston Med. & Surg. Jour., Feb. 6, 1908.

Experience, thus far, has shown that patients suffering from Hodgkin's disease and leukæmia are exceedingly susceptible to the toxins, being unable to stand more than very minute doses.

In Hodgkin's disease as well as in leukæmia, I believe that we have a group of tumors which, while they may have many of the characteristics of infectious disease, have, on the other hand, certain very definite clincial and anatomical features which point even more strongly to a neoplastic origin.

In view of this strong clinical evidence in favor of a neoplastic origin, it would seem illogical to exclude Hodgkin's disease from the class of malignant tumors, simply because it resembles an infectious process a little more closely than the ordinary types of malignant tumors. With more reason might we say that the fact that this group of cases is of probable infectious origin, adds still further to the already increasing weight of evidence that the whole group of sarcomatous tumors are of infectious origin.

We now know from the experiments of Beebe and Ewing that the lymphosarcomas of dogs, acknowledged to be of infectious nature and, until recently believed by the majority of pathologists to be infectious granulomata, have been finally classed as true sarcomas.

While the multitudinous varieties of malignant tumors as classfied by pathologists, would apparently point to a great variety of specific causes, if we assume a microbic origin, a careful study of the question tends to strengthen the theory held by Ballance, of London, that all these varieties may be due to a single microbic cause which, under varying conditions, gives rise at one time to proliferation of connective tissue cells, at another to epithelial, and at other other still, to endothelial cells.

Strong evidence in support of the essential unity of malignant tumors is found in the recent discoveries of Ehrlich and Loeb, in their investigations in mouse tumors. Ehrlich found that in successful transplantation of mouse carcinoma in the twelfth generation, a typical carcinoma became transformed into a sarcoma.

Louis Loeb observed the same transformation of carcinoma in a Japanese mouse to sarcoma in the second generation. There have already been two instances of sarcoma and carcinoma developing within an inch of each other under the stimulating effects of the X-rays. I have myself observed two cases of primary carcinoma with metastatic recurrences that were typical sarcoma and vice versa, two cases of primary sarcoma with recurrent carcinoma (one local, one metastatic).

CONCLUSIONS

1. The clinical features of Hodgkin's disease are often so nearly identical with those of round-celled sarcoma, that it is impossible to differentiate the two conditions.

2. The histological features so closely resemble sarcoma, that if a given specimen be examined by different pathologists, opinions would be about equally divided between Hodgkin's disease and sarcoma.

3. The onset of the disease, its course and duration, formation of general metastases, and final going-on to inevitable death, most closely simulate sarcoma.

4. While, in most cases, the metastases occur in pre-existing lymph glands tissue, this is by no means always true, since in some cases, e. g., Gibbons' and my own, the tumor breaks through the capsule, infiltrates the surrounding tissues, fascia, muscle, periosteum, and the bone itself.

5. The fact that Hodgkin's disease and leukæmia have certain features pointing to an infectious origin, should not exclude them from being classed as malignant tumors; but, on the contrary, this fact furnishes additional evidence in favor of the infectious origin of sarcoma.

6. In view of the utter hopelessness of Hodgkins disease as well as leukæmia from surgical and medical treatment, and in view of the remarkable results obtained, though in a very limited number of cases, with the X-rays and toxins, the best chance of success apparently lies in a wider application of these methods of treatment, either singly or in combination.

BIBLIOGRAPHY

1. Dorothy Reed. Johns Hopkins Med. Reports, vol. x, 133, 1902.
2. Charles F. Martin. Journal of Medical Research, July, 1901, p. 249.

3. Channing C. Simmons. Ibidem, June, 1903, p. 378.
4. Hy. Walter Gibbons. Amer. Jour. of the Med. Sciences, November, 1906.
5. Sternberg. Zeitschrift für Heilkunde, xix, p. 21, 1898.
6. Banti. International Clinics, iii, Series 16, 1906.
7. Pfeiffer. Tübingen Klinic, Bruns's Beiträge zur klinischen Chirurgie, p. 263, 1906.
8. Longcope. Bulletin Ayr's Clin. Laboratory. Pennsylviania Hospital, No. 1, 1903.
9. La Roy and Gand. Archives Internationales de Chirurgie, 1907, vol. iii, fasic. 6.
10. Stongel and Pancoast. Jour. Am. Med. Assn. April 25, 1908.

HOW FREQUENTLY DO GASTRIC ULCERS BECOME CARCINOMATA?[1]

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IT is passing strange that internists in general do not more fully appreciate the accidents or surgical complications inseparable from gastric ulcer. While recognizing, to a limited degree, some of its dangers, such as hæmorrhage and perforation, they are almost oblivious, as a class, to even greater dangers which either destroy the patient or transform him into a chronic invalid, for whom life has few attractions. We should keep constantly before us the statement of that conservative and accurate pathologist, Virchow, who emphasizes the fact that 35 per cent of all carcinomas are in the stomach; and we will show later on that, at least one-half of them, probably more, are the direct result of neglected gastric ulcers.

That there are some few physicians who keenly appreciate the dangers, direct and indirect, functional and mechanical, of gastric ulcer and promptly refer suitable cases for operation is fortunately true, but that this class is a small one, is only too apparent when the records of any operating surgeon are carefully studied, for it will be seen that a large percentage of all gastric operations are simply exploratory, the disease having advanced too far for a radical operation.

Of all the remote dangers of gastric ulcer, the greatest of them (malignant disease) is scarcely appreciated at all by physicians. And yet the idea that ulcer of the stomach may degenerate into malignant disease, is, by no means new or limited to surgeons. So long ago as 1839, Cruveilhier (1), although recognizing the intrinsic differences between ulcer and cancer, nevertheless clearly pointed out that in one predisposed the former may become converted into the latter, and Rokitansky (2) had stated that cancer may complicate perforating ulcer of the stomach.

In 1848, Dittrich (3) reported 8 cases in which caricinoma of the stomach had probably developed from ulcer. Remarkable as it may seem, Dittrich himself was not inclined to consider the association of the two processes as one of cause and effect, but rather believed it to be fortuitous.

Rokitansky (4), in 1849, had already accepted the belief that carcinoma was often preceded and caused by ulcer. I quote his words: "There are cases in which we can plainly see that a carcinoma has developed from an ulcer of the stomach."

Eight years later, in 1857, Brinton (5) reported a case in which post-mortem examination proved beyond question that an ulcer had undergone carcinomatous degeneration and that the malignant disease had developed in the edges of the ulcer and had gradually invaded the base.

From time to time, reference was made to the subject by other authors, conspicuous among whom may be mentioned Waldeyer, Potain, and Zenker, all of whom expressed belief in the occurrence of malignant degeneration from simple round ulcer.

In 1883, Zenker's pupil, Hauser (6), made the most thorough study of the subject up to that time, with the result that he considered

[1] Read before the American Surgical Association, May 5, 1908.

practically *all cases* of gastric carcinomata as consecutive to gastric ulcer, believing that the cancerous process may be superimposed either upon an ulcer still active or upon the cicatricial remains of one. As the result of histological studies of the edges of chronic ulcer during cicatrization, he found that there was only a slight difference between carcinomatous proliferation of the glandular epithelium and atypical growth of the glands during the formation of the scar.

In studying a carcinoma of the stomach which had been removed by Heinecke, Hauser observed, too, that there was considerable space between the base of the ulceration and the muscular layer of the stomach, a condition which he had never known to exist in primary gastric carcinoma.

Between the years 1883 and 1890, a number of other observations, notably by Haberlin (7), were recorded. This author described fourteen cases, not all of which, however, could be considered authentic. He believed that 4 were undoubtedly positive, 6 fairly so, 3 probable, and 1 doubtful.

Sonnichsen (8) found that, out of 156 cases of carcinoma of the stomach which came to autopsy in the pathological institute at Kiel from 1873 to 1891, 22 or 14 per cent undoubtedly developed in the scars of ulcers or in fresh ulcers themselves. He significantly remarks, and was one of the first to emphasize it, that most of these were at the pylorus. He further states that many others might have thus originated, but that the carcinomatous process was so extensive as to cover up pre-existing scars or ulcers, if such there were.

Klausa(9), working in the same institute, and following up the work of Sonnichsen, showed that between 1891 and 1900 there were a still greater number of carcinomata having their origin in ulcers. Out of 120 cases, he positively determined that 32, or more than 26 per cent, grew from either ulcers or cicatrices.

Fütterer (10), of Chicago, in 1892, collected 52 cases demonstrating malignant change in ulcers originally benign; 7 were in his own practice. These cases were collected with great care from the literature and but few, if any of them, admit of a reasonable doubt. The conclusions of Fütterer are so logical and reasonable that they should convince the most sceptical. They are as follows:

1. If a carcinoma develops from a chronic ulcer of the stomach, then this development occurs from those parts of the edges of the ulcer which are most exposed to mechanical irritation by the contents of the stomach.

2. In the pyloric region, it is the lower pyloric margin of the ulcer which is most exposed to mechanical irritation, and from which carcinoma develops. But other parts of the edges may be the ones involved when dilatations and adhesions have changed the position of the organ.

3. Development of carcinoma from ulcers of the stomach in the pyloric region occurs with great frequency, while such a development occurs less often in other parts of the stomach.

4. If this (3) be true, then we must, in all cases in which an ulcer of the stomach or its scar narrows the pylorus, recommend early a gastroeneterostomy to prevent the development of carcinoma. If a gastroenterostomy has been made, then the mechanical irritation of the ulcer in the pyloric region by food is reduced, and the severe friction necessary to produce a carcinoma will probably not occur.

5. A patient suffering from the consequences of a stenosis of the pylorus, particularly if this be caused by ulcers and scars, should, if a gastroenterostomy is not performed, be advised to eat slowly and little at a time, and be particularly careful about carbohydrates and especially hard crusts of bread; they should avoid richly fried, or other coarse food, and they should, as much as possible, confine themselves to liquid or semi-liquid foods. A good deal of fatty food should be recommended.

6. Elderly people, in particular, who have but few or no teeth, and a saliva which is insufficient in quantity and quality, must be most carefully advised as to their diet, and to such patients taka disatase should be administered.

7. From the fact that carcinoma does not develop from the large ulcers alone, but may be developed from the very smallest, the prognosis of ulcer of the stomach is bad. Our aim, therefore, should be to prevent the formation of ulcers, rather than to heal them after they

are formed; and this may be done, at least, to a certain extent, by the energetic treatment of all cases of chlorosis and secondary anæmia which come under observation.

He also studied the age incidence and found that persons from 26 to 75 have suffered such degenerative change.

It is also interesting to note that Schmincke (11), in 1902, reported a case in a patient aged 16, Mayo Robson one at 20 in the same year. Still younger subjects have suffered from gastric carcinomata, as I have encountered in reliable literature 6 cases between 10 and 20.

Ssapeshko (12), found that of 100 gastric carcinomas, only 10 cases did not originate on the base of a peptic ulcer. The same author reports cases which had developed pyloric carcinoma five or more years after a gastroenterostomy had been done for ulcer.

Stich (13), states that ulcer-carcinoma constitutes 30 per cent of the entire number of gastric cancers.

Oettinger (14), in 1903, reported 3 cases, 2 of them demonstrating in a most striking manner the development of carcinoma upon the edges of chronic ulcer. Macroscopically it was impossible to differentiate between callous ulcer and carcinoma. Microscopically, however, cancer cells were found in both, taking origin apparently from the cul-de-sacs of the mucous glands adjacent to the ulcer. In one of these cases, although the lesion was extremely limited, it had, notwithstanding this fact, given rise to extensive metastasis in the liver. In this case the glandular cul-de-sacs were elongated and the mucosa thickened, its superficial portion being the seat of an interstitial gastritis of varying degree. The alveoli were also filled with cellular elements, which had already begun to undergo malignant changes. These findings not only confirmed Fütterer's histological observations concerning the growth of cancer from the edges of ulcers, but also those made previously by Mathieu and Hayem relative to the condition of the alveoli.

The following year Jedlicka (15) states that, in a series of apparently inflammatory pyloric tumors, there were 26.6 per cent of ulcer carcinomas demonstrated microscopically.

French observers, notably Doyen, consider that a large percentage of gastric carcinomata have their origin in inflammatory lesions.

Rivière-Jaboulay states that 20 per cent of his cases were preceded by well-marked history of ulcer.

W. J. Mayo (16) found that in 54 per cent of the cases of cancer of the stomach submitted to resection in 1905–6 at the Rochester Clinic, both the clinical history and pathological examination of removed specimens made it certain that the cancers had their origin in ulcers.

Moynihan (17), writes that "in his last 22 cases of gastroenterostomy for cancer, close inquiry was made into the previous history with respect to gastric ulcer. The evidence in this series of cases shows that in 16 out of 22 patients, 72.1 per cent, there had been previous gastric ulcer. The shortest interval between the attack of gastric ulcer and the onset of symptoms which led to my seeing the patient for a condition which proved to be malignant was three years; the longest interval was twenty-six years."

Great significance should be given this statement of Mr. Moynihan, because of his former belief that cancer was infrequently preceded by ulcer.

Mayo Robson (18) stated, in his Bradshaw Lecture before the Royal College of Surgeons, that 59.3 per cent of the cases of cancer of the stomach on which he had operated gave a history of chronic ulcer. He, therefore, insisted that the operation of excising the ulcer-bearing area must be more frequently done in the future. Furthermore, of 112 posterior gastroenterostomies performed by Mr. Robson for ulcer, four patients died subsequently of carcinoma, which developed in one patient at the end of a year after a perfectly successful gastroenterostomy; in one after $2\frac{1}{4}$ years; in another after $2\frac{1}{2}$ years, and in the fourth after $3\frac{1}{2}$ years. All enjoyed good health between the gastroenterostomy and the onset of cancer symptoms. The time intervening renders it unlikely that a mistake in diagnosis could have been made in any but the first case. There are other cases in this series where it seems more than probable that death was due to cancer.

I have within two years encountered nine

patients suffering with gastric carcinoma; seven of them were at the pylorus, all giving an unmistakable history of previous ulcer. In two, the interval between the ulcer and its malignant transformation was as long as 25 years. In two others, both of whom were operated on within the past six weeks, the interval was brief, less than a year in one of them.

DIAGNOSIS

Naturally, it is asked, can a clinical diagnosis of gastric ulcer undergoing cancerization be made. In my judgment it is simply impossible to do so with anything like approaching accuracy until the abdomen is opened; and even then after the growth is inspected, palpated, and carefully scrutinized, frequent mistakes must occur, even with those most experienced in gastric diseases. Every surgeon to whom I have written has reported one or more cases, where he had made such a mistake, and nearly all have emphasized the impossibility of making an accurate diagnosis except by the microscope.

In some cases, the classical symptoms of chronic ulcer are so well marked that there is not the slightest suspicion of carcinoma, and it is only when the abdomen is opened that the true nature of the lesion is revealed. If patients thus affected are not operated upon, they succumb to hæmorrhage and their death is attributed to bleeding from an ulcer. In another class of cases, the symptom complex of ulcer is modified after two, three, or more years, so that a well-founded suspicion of malignant degeneration may arise in the mind of the medical attendant. Anorexia becomes pronounced, the pain more constant, the attacks of hæmatemesis more frequent, the vomited blood darker. In addition to these two forms, which pathologically probably correspond to slow cancerous degeneration of an ulcer and development of cancer upon the remains or edges of an ulcer, respectively, Tuffier (19) has recently described a form to which he applies the term latent ulcer-cancerous almost from its beginning. Here the symptoms of ulcer are absent, or are present in very slight degree, such as mild dyspeptic disturbances, which may last for a number of months. After a short time, however, the signs of cancer develop rapidly, there being complete anorexia, vomiting of dark blood, considerable anæmia, and rapid deterioration of the general health.

Oettinger, who has carefully investigated this subject, while admitting the impossibility of making an accurate diagnosis in a majority of instances, states: "There are, however, certain circumstances which may lead one to suspect malignancy; thus, if pain persists, despite the employment of dietetic and therapeutic measures, which generally control it in acute ulcer, and continues to be present late in the disease, we may justifiably expect that the lesion is not benign. The character of the pain is neither that of simple ulcer, which is so commonly relieved when the patient vomits, or assumes a special position, nor is it that of cancer, which is, as a rule, not severe. The pain is violent, constant, radiating to the ribs, and thence to the lumbar region, particularly to the last dorsal or first lumbar vertebræ. A second symptom is anorexia. Refusing nearly all food, the patients rapidly become emaciated and weak. The amount of vomited matter is rarely large, although the patients vomit very frequently."

He later states: "Little of value is to be learned from analysis of the gastric contents in these cases, as the chemical characteristics may be the same as in simple ulcer."

The rapid and regular diminution or disappearance of hyperacidity at intervals is, according to those best versed in the subject, the most important sign to be derived from such examination. Hayem, who has done much work along this line, states that when hyperchlorhydria is superceded by achlorhydria, it is almost certain that cancer is developing.

Albu maintains that an early diagnosis of gastric cancer can oftentimes be made, if it can be shown that a slight, but progressive loss of weight is taking place. If may be so slight as to escape the notice of the patient and physician until finally it is so marked as to be apparent to all. He furthermore emphasizes the fact that this slight loss in weight continues in spite of extra nourishment taken between meals in the form of concentrated and easily digested foods. Therefore, he believes that, if the patient loses weight steadily, although enjoying his meals, seemingly digesting

them, and, in addition, partaking of nourishing food between meals, a diagnosis of carcinoma is justifiable. This loss of weight, he says, occurs in carcinoma of the fundus as well as of the pylorus. The differentiation between these two forms, he believes, may be made by testing the functional activity of the stomach. In the beginning of carcinoma of the fundus there is little or no diminution in motility; free HCl is markedly decreased or absent. Thus, we have a picture of chronic atrophic gastritis. In carcinoma of the pylorus, on the other hand, there is very early seen a marked impairment of gastric motility and there is a steady decrease in the amount of HCl; in other words, we have pyloric stenosis plus a constant diminution in the HCl from month to month, perhaps from week to week. The subjective symptoms are so widely variant in different cases, and in the same case from time to time, that they are practically valueless.

I fully endorse the above observation, having frequently seen patients the victims of inoperable growths when there were only the slightest gastric symptoms present.

The belief originating with Hauser, and reinforced by the opinion of Rosenheim in 1889, that ulcus carcinomatosum is *always* characterized by hyperchlorhydria is, in my judgment, inaccurate and misleading. That such may be the case on account of the acuteness of all symptoms where cancer follows ulcer, I do not question, but that it is necessarily, or even usually so, has not been my experience. I fully endorse the opinions of Hayem that achlorhydria, rather than hyperchlorhydria, is the condition more likely to be encountered.

I wish to say again what I have frequently done before, that gastric analyses are oftentimes misleading and should never be absolutely relied upon in making a diagnosis.

In reference to examination of the blood, Hayem remarks that little, if anything, can be learned from it.

Age is certainly not the guide it was formerly thought to be, for we have shown that cancerous changes have taken place in patients from 16 to 75 years of age. An analysis of the most authentic recorded cases, however, shows that the phenomenon of cancerization is most frequent in persons past forty.

PATHOLOGY

For a correct understanding of the whole subject and particularly concerning the relation of gastric ulcer to gastric cancer, an adequate knowledge of the manner in which ulcers heal is important. Small, shallow ulcers heal as the result of fibrous cellular thickening of the submucosa, so that the edges of the mucous membrane are drawn together and finally become blended with the muscular layer. A stellate scar of varying size remains (Rokitansky). If the entire ulcer undergoes this process and becomes covered with a layer of epithelium, it may be correctly stated to have healed. The protective layer of epithelium prevents action of the stomach acids upon the connective tissue, which is already poor in blood supply and consequently of low resistance. Thus, formation of connective tissue together with contraction inaugurate the process of healing, and consolidation of the approximated mucous edges ends it. If the ulcers extend to the muscular layer of the stomach, however, this healing by connective tissue proliferation can take place only very slowly, because connective tissue corpuscles are very scanty in the interstices between the bundles of muscle fibers. Under favorable conditions, however, healing of such deep ulcers may occur, but instead of a scar there is firm adherence of the mucous membrane to the deep layers of the stomach, the intermediate layer having been destroyed during the acute stage of the sore. The glands in the periphery around the scar show various alterations in form, as the result of the compression and distortion to which they have been subjected by the connective tissue. Their epithelium is also altered, being either purely cubical or cylindrical. Here and there the glands perforate the muscularis, where they may become dilated, forming sinuses, cysts, or large spaces lined with epithelium. The scar tissue itself seems poor in blood-vessels.

If the ulcer is large, perforates the muscularis, and becomes adherent to some neighboring structure, contraction of the scar tissue will not be sufficient to completely close the ulcer. Such ulcers do not heal. Although there is a proliferation of connective tissue cells at its base, the surface remains exposed to the action

of the gastric juice. If proliferation in the deep layers does not proceed pari passu with this disturbance in the surface part, then the ulcer becomes deeper and hæmorrhages, caused by erosion of large vessels, result.

The edges of the ulcer, as well as its base, are also subject to chronic inflammation, so that great thickening of the submucous tissue is observed.

Such pathological changes justify the physician, who is accustomed to see cases in which symptoms of gastric disease characteristic of ulcer have existed for years, in making a diagnosis of chronic ulcer with partial healing, if some tumor-like thickening can be felt upon palpation. A circumstance which lends additional weight to this supposition, is our clinical experience with carcinoma of the stomach, which we know usually causes death not later than eighteen months after the first manifestation of symptoms, frequently in a much shorter time, rarely after a longer period. The apparent exception to this rule, namely, cases in which all signs of ulcer have been present for years, but in which post-mortem examination reveals a carcinoma, I believe to be ones in which malignant has developed from benign lesions. The changes in the glands must be borne in mind. As Hauser has demonstrated, the glandular proliferation is atypical, depending not upon an increase of normal function, but upon a diminution of the same, indeed sometimes upon a complete cessation of action. They are over-stimulated by irritation due to the greatly increased supply of nutriment they receive and by the absence, partial or complete, of the firm tissue which serves to support them. If this process continues while thickening of the scar tissue still goes on, the conditions for gradual transformation of the glandular elements into carcinoma are very favorable.

TREATMENT

We have, I think, not only shown that gastric ulcers frequently tend to undergo malignant degeneration, but that it is difficult, almost impossible, to recognize clinically the change which is going on. If cases are in a hospital where they can be carefully studied and are under close observation, one may sometimes infer that cancerization of an ulcer has begun, if the clinical history, gastric analyses, symptoms, and physical signs all, or most of them, point in the same direction. In the majority of instances, a diagnosis in the present state of our knowledge is simply out of the question. This, it seems to me, is the very strongest plea for a more frequent and early resort to exploratory laparotomy in all gastric cases of doubtful nature failing to yield to medical treatment within a reasonable time.

If, after the lesion is inspected, palpated, and fully examined in every way, malignancy, actual or potential, is to be feared, certainly radical treatment of such lesion is demanded, for W. J. Mayo writes me that "The main field for the Rodman operation, as we find it, is an inability at the operating table to tell a carcinoma from an ulcer. In three cases out of four, when we remove a suspicious ulcer, it proves to be a carcinoma and a number of cases after gastroenterostomy for supposed ulcer have developed carcinoma so quickly as to make it almost certain that it existed at the time of the operation."

Unquestionably gastroenterostomy lessens the irritation caused by food passing over an ulcerated surface, and, therefore, tends to diminish somewhat the chances of future malignant degeneration. It does not, however, prevent it, as can be shown by any number of cases subsequently going wrong one, two, three, four, five, or more years after an apparently successful gastroenterostomy. Moreover, there is abundant proof that degeneration of cicatrices, as well as fresh ulcers, not infrequently takes place.

The difference between the operative mortality of a radical treatment of the lesion, whether it be by simple excision, pylorectomy, or partial gastrectomy, and gastroenterostomy is slight, whereas the end results are better, more abiding and beneficent in every way, preventing, as the radical procedure does, future hæmorrhage, perforation, hour-glass stomach, pyloric stenosis, and malignant degeneration.

The results of pylorectomy or partial gastrectomy for cancer have hitherto been far from encouraging, as Kocher—who has, perhaps, had the greatest experience in resection—has seen

only 9 per cent of his cases pass the three-year limit without recurrence. Better results, in my judgment, will not be forthcoming until physicians diagnosticate and refer their cases more promptly and surgeons are given an opportunity to operate while the lesion is still a local one, or, what is infinitely better, in a precancerous state. No one hesitates to remove a suspicious lesion in the breast, the uterus, the lip, or the tongue, as the tendency to malignant transformation of such lesions is so generally appreciated as to be a surgical tenet. Why should a different rule be applied to the stomach? A pylorectomy, or partial gastrectomy, for ulcer is a comparatively simple affair and followed by the best and most abiding results. It is necessarily a serious operation, and may be only of temporary benefit when carcinoma has actually developed.

BIBLIOGRAPHY

1. Cruveilhier. "Anatomie pathologique du Corps humain," 1839.
2. Rokitansky. Oester. Jahrb., xviii, 1839.
3. Dittrich. Prager Viertejahrschrift f. die praktische Heilkunde V.
4. Rokitansky. Lehrbuch der Pathologische Anatomie, 1849.
5. Brinton. Diseases of the Stomach, 1857.
6. Hauser. Das chronische Magengeschwür sein Vernarbungs process und dessen entwicklung zum Magencarcinom, Leipzig, 1883.
7. Haberlin. Ueber die Verbreitung und die Aetiologie des Magenprebses. Deutsch. Archiv. f. klin. Medizin, 44 Bd.; also Inaugural Dissertation, Kiel, 1892.
8. Sonnichsen. Inaugural Dissertation, Kiel, 1892.
9. Klausa. Uber die Entslehungdes Magencarcinoms aus Chronischen Magengeschwüre. Inaugural Dissertation, Kiel, 1900.
10. Fütterer. Journal Am. Med. Ass'n, March 15, 1902.
11. Schmincke. Inaugural Dissertation, Würtzburg, 1902.
12. Ssapeshko. Annalen d. Russ. Chir., 1900, No. 6 (Mitteilungen a. d. Grenzgeb. d. Med. u. Chir., 1902.)
13. Stich. Beitr. zur Magenchir. in Brun's Beitr., 1903, xl, No. 2.
14. Oettinger. La Semaine Médicale, xx, 1903.
15. Jedlicka. Chronische Magengeschwüre, Prague, 1904.
16. Mayo. Annals of Surgery, June, 1907.
17. Moynihan. Brit. Med. Journal, Feb. 17, 1906, 370.
18. Robson. Brit. Med. Jour., Nov. 17, 1906, 1345.
19. Tuffier. Diseases of the Stomach, 1907.

INFANTILE HYPERTROPHIC STENOSIS OF PYLORUS[1]

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THE most complete operative statistics upon this subject up to October, 1906, are undoubtedly those given by Dr. George Thompson ((Surgery, Gynecology and Obstetrics, Chicago, 1906, vol. iii, 521). These include 89 operative cases. To these I have been able to add 25 others collected to this date, not including one of my own, the history of which I wish to report at this time.

S. G., age 4½ weeks, male, white, was admitted to Charity Hospital, May 31, 1907. Father and mother living and well. No hereditary tendencies.

The child at birth weighed 7½ pounds, and had increased in weight to 8½ pounds at the end of three weeks; from this time on it began to vomit, ceased to urinate, bowels refused to move, and it lost in weight from one to four ounces daily up to the time of operation, when he was 4½ weeks old and weighed 6¾ pounds.

The diagnosis, made by Dr. J. P. Sawyer, who referred the case to me, was based upon the persistent and late character of the vomiting (about one hour after feeding), by its refusal to respond to changes in feeding and to stomach treatment, by its progressive emaciation, and by the visible stomach peristalsis. We were not able, even with greatly emaciated abdominal walls, to palpate any pyloric enlargement or tumor. At the time of the operation the baby was extremely feeble, looking like an ordinary marasmic infant, and having its face and scalp covered with a scaly eruption.

Operation under ether anæsthesia. Median incision, nearly 3 inches long, above umbilicus. The stomach was partly delivered and the pyloric end was represented by a hard, almost cartilaginous-feeling mass, which could not be indented by the fingers, measuring about ⅔ of an inch in length and a little over ½ inch in thickness. Stomach wall not particularly hypertrophied.

[1] Read before the American Surgical Association, May 2, 1908.

An anterior gastroenterostomy was made, for the reason that it seemed it could be done with less stomach and intestinal exposure and manipulation and cause greatly less shock. The only difficulty was the minute calibre of the jejunum, but, as happens in the adult, after manipulation the shriveled and contracted jejunum swelled to nearly twice its apparent size and two small, curved, rubber-protected clamp forceps were used to hold the stomach and intestine until the anastomosis was complete.

The parietes were closed by through and through silkworm gut sutures.

The baby's temperature averaged 103° for several days following the operation, and it continued to lose in weight until the eighth day, when it weighed but 6 pounds.

The feeding of the infant presented many difficulties. Vomiting was easily stimulated. In general, the feeding consisted of 1 oz. of albumen water every two hours, alternating with 1 oz. of diluted cream every two hours. In addition, the milk from its mother's breasts was pumped out and 1 ounce given by rectum to the child every four hours, and in addition frequent inunctions of sweet oil were resorted to. On the sixth day, artificial mouth feeding was stopped and baby was put to the breast. Continued rectal feeding with peptonized milk. As it continued to fail, breast feeding was stopped on the tenth day and modified milk, composed of whey, cream, sugar of milk, and lime-water, was given it from the bottle for a week, from which time milk was gradually added and improvement became marked, so that, at the end of eight weeks, its weight had increased to eight pounds, and at present the baby presents the appearance of any fairly well nourished child of one year.

So much has been written during the past eighteen months from the medical standpoint regarding the treatment of congenital pyloric stenosis, and, in many cases, deprecating surgical intervention, that it seemed to me worth while to review the surgical side of it up to this date and see whether we had anything definite and of demonstrable value to offer toward the alleviation of a condition which, I am sure, will become increasingly more frequent when the vague condition of marasmus is more carefully studied and the true pathologic condition recognized.

Pathology. As no opportunity for microscopic examination presented itself in this case, nothing can be added to the theories already prevalent. That fœtal pyloric stenosis from hyperplasia may occur, is shown by Dent in a photograph of a specimen from a seven months' fœtus, and it is suggested that this represents an atavistic tendency or reversion to an earlier type of development, since the circular muscle is well marked in the pylorus of many mammalia, or that the hypertrophied pylorus is analogous to the gastric mill of crustacea, the gizzards of birds, etc.

Some have ascribed this condition to a primary derangement of the nervous mechanism of the gastric muscle, resulting in incoordination, while the majority ascribe it to gastric irritations causing spasms of the pylorus and subsequent hypertrophy; and this, in spite of autopsies in cases in which no hypertrophy was demonstrable, though persistent spasm had been a prominent feature.

Undoubtedly, it would be of great aid in deciding whether to employ medical or surgical measures for relief, were the true pathology settled, for a true congenital hypertrophy could scarcely be expected to subside under medical treatment and would call for immediate operation, without the delay incident to the institution of medical treatment; while we might confidently expect that a very considerable number of cases of acquired hypertrophy, due to persistent irritation and spasm, would be benefited, or even cured, by appropriate feeding and medical care.

It seems reasonable to suppose that both conditions may exist, and may thus account for the varying results of treatment; and the number of cases simulating stenosis, in which pyloric spasms exist without hypertrophy, may add a considerable group to those reported as cured medically.

Until more definite means can be established for determining which are congenital and which acquired cases, it would seem that the term infantile hypertrophic pyloric stenosis would be preferable to congenital.

Of the symptoms of infantile pyloric stenosis, peristalsis is undoubtedly the most important single one, and is mentioned in 15 out of 18 cases, or in 84 per cent. This is a considerably higher percentage than that given by

Thompson, who estimates it at about 33⅓ per cent.

Pyloric tumor is a most important, though not constant symptom, and is apparently being more commonly recognized with increasing observations. Thus, Thompson quotes Nicoll as stating that he palpated a tumor in 20 per cent of his cases. Scudder says it was reported present in 18 per cent out of 115 cases. In 14 cases reported by Thompson since January, 1905, it was present in 50 per cent, while in 13 additional recorded cases which I have collected it was present in 69 per cent.

In considering the treatment best to be advised in these cases, the question of prognosis naturally must influence us for or against surgical intervention. In true congenital stenosis of the pylorus the prognosis is probably uniformly fatal. The average age at death in these cases, as given by Meltzer, is 9½ weeks. But it must be very difficult to distinguish these cases from the infantile form, in which Still (Lancet, 1905) says that typical cases with visible peristalsis and a hard, palpable pylorus, recover completely under medical treatment and show no tendency to recurrence; and Bloch (Jahrb. f. Kinderheilk., Berlin, 1907, lxv, 336) reports 8 cases cured and two that died under medical treatment.

Thus far it is probably, though not certainly, true that the cases that are submitted to surgical interference are the more severe cases of pyloric stenosis, and not only that, but they come to operation so late that the infant's vitality has been reduced nearly to the minimum. Thus, in the cases which I have collected and added to those already collected by Thompson, the average age at onset of symptoms was 13 days, while the average age at operation was 52 days. This certainly seems an unnecessarily long time to delay operation. The records of cases are extremely incomplete in many instances, but in those in which age was mentioned, the average age of those that died was 57 days, and of those recovering 34 days, certainly a very decided difference in favor of earlier operations.

The following tables show the mortality in 114 cases, together with certain other facts bearing particularly upon the nature of the operation performed:

Operation.	No.	Recovered.	Died.	Mortality.
Divulsion	27	13	14	51.8%
Gastroenterostomy	69	32	37	53.6%
Pyloroplasty	17	8	9	53%
Pylorectomy	1		1	100%
Total	114	53	61	53.5%

This table shows practically little variation from the figures for 89 cases, given by Thompson. There has, however, been no reduction but rather a rise in mortality in the last 25 cases reported.

Mortality from Thompson's	89 Cases.	114 Cases.	Additional 25
Divulsion	50%	51.8%	50%
Gastroenterostomy	51%	53.6%	50%
Pyloroplasty	55%	53%	60%
Pylorectomy	100%	100%	——

It is rather surprising that an operation, seemingly so unsurgical in its method and so unpromising as to its permanency as divulsion, should show the most favorable percentage of recoveries, and this cannot be due alone to the smaller number of cases, for in this class we have 27 cases with a mortality of 51.8 per cent, while in pyloroplasty there are but 17 cases with a mortality of 53 per cent. It seems to me that it tends to emphasize the probability of this pyloric stenosis being very frequently an acquired form, since the divulsion, though conceivably only temporary in character, might permit of so much improvement from medical and dietetic treatment, as to make the cure practially permanent and perfect, particularly if the hypertrophy were due to pyloric spasm.

Aside from the inherent dangers of operation upon the marasmic babes, the mortality from divulsion seems to have been due: 1. To failure to overcome stenosis (insufficient dilatation); 2. Rupture of pylorus through peritoneal coat; 3. Hæmorrhage.

Pyloroplasty, with a mortality slightly less than that of gastroenterostomy, would apparently be the operation of choice, and would accomplish in the safest, easiest, and most correct manner the relief sought, and yet I can

find but 17 cases in which this operation has been performed. There must evidently be some reason, other than a preconceived preference for gastroenterostomy, to account for the small number of pyloroplastic operations, and this reason seems to me to lie in the fact that operators have considered the hard, thickened, elongated, cartilaginous-feeling pylorus to be a barrier to its successful accomplishment. Dent has been an advocate of pyloroplasty, reporting 50 per cent of recoveries in 14 cases, and seems to consider the technical difficulties practically negligible. He uses a single row of Halstead sutures, which simplifies the operation very materially. Cantley is of the same opinion, and says that, if the muscle is very thick and hard, a portion on each side can be snipped out before suturing. I must confess that in my own case I resorted to gastroenterostomy because I could not conceive of its being physically possible to perform a successful plastic operation upon the hardened and thickened pylorus; and, in the absence of further clinical experience, I should not feel justified in attempting it should another similar case present itself, though in less aggravated cases it would, probably, prove a better operation than gastroenterostomy.

In seeking the probable causes of death, as given in reported cases, we find marasmus and shock to be the principal factors, and one late death, 54 days after operation from ileocolitis, probably not dependent upon the operation. Gastroenterostomy has been performed in 69 reported cases of infantile pyloric stenosis, more than four times as often as pyloroplasty, and scarcely three times as often as divulsion. This disproportion in figures would seem to confirm the thought that, to most operators, the chances of securing a successful result from a pyloroplasty have not seemed encouraging.

Whether the anastomosis was anterior or posterior has been omitted in the majority of cases, but in those in which this detail is mentioned the preponderance is slightly in favor of the posterior method. Obviously, the button method is not a desirable one and the suture has been resorted to in all but one case.

The anterior or posterior method will probably continue to be used, as the judgment or experience of the operator may decide. It seems to me that the anterior method could be resorted to with less handling of the stomach and intestines, with freer space for application of clamps, better control over possible complications entailing loss of blood during operation, and, therefore, less danger from shock.

The jejunum, as it appears when the abdomen is first opened, is so extremely small that the application of clamps would seem to be out of the question, yet upon manipulation and exposure, just as in the adult, it increases very markedly in diameter, and small curved clamp forceps covered with rubber tubing can be used for stomach and gut. This expedites the operation and reduces the hæmorrhage to practically nothing, both important factors in lessening the death rate.

The principal causes of death following gastroenterostomy in these case have been shock, convulsions, prolapse of gut, and peritonitis.

If one would be entitled to draw any conclusions from this résumé, they would be:

1. Congenital stenosis and infantile stenosis are of decidedly different clinical significance.

2. Congenital pyloric stenosis would in all cases call for very early operative interference.

3. Infantile pyloric stenosis develops after birth and is often amenable to medical treatment, but in the absence of improvement an early operation offers an excellent prospect of recovery.

4. There does not seem to be, as yet, any positive way to distinguish between the congenital and infantile forms. The earlier the symptoms, the more probable the congenital form.

5. In selected cases pyloroplasty offers results superior to those of gastroenterostomy, and should be the operation of choice.

6. There has been no recent improvement in operative results.

7. The one great determining cause of death in practically all cases is delay, and it is obvious that, until this obstacle is removed by the medical attendant, little or no improvement on the present statistics can be expected.

BIBLIOGRAPHY

Bloch, C. E. Jahrb. f. Kinderheilk., Berl., 1907, lxv, 336, 352, 477, 551.

Carpenter, George. Brit. Jour. Children's Dis., 1905, ii, 408, 512.

Carpenter, George. Brit. Jour. Children's Dis., 1905, iii, 365.
Carpenter, George. Rep. Soc. Study Dis. Children, London, 1906, vi, 27–34.
Cantley, E. Brit. Jour. Children's Dis., 1905, ii, 512.
Cantley, E. Brit. Med. Jour. London, 1906, ii, 939–942.
Fischer, Louis. Arch. Pediat., 1906, xxiii, 341.
Hartley, Frank. Arch. Pediat., 1907, xxiv, 207–214.
Hirschsprung. Jahrb. f. Kinderheilk., 1888, xxviii, 61.
Ibraheim. Brit. Jour. Children's Dis., 1906, iii, 364.
Keefe, John W. Providence Med. Jour., 1906, vii, 104.
Kimbal, R. R. Arch. Pediat., 1907, xxiv, 207-214.
Morse, John Lovett. Bost. Med. & Surg. Jour., 1906, clv, 343.
Munro, John C. Arch. Pediat, xxii, 727.
Patterson, H. J. Lancet, March 3, 1906.
Putnam, C. P. Brit. Med. Jour., London, 1906, ii, 945–948.
Ramsey, W. R. St. Paul Med. Jour., 1906, viii, 717–723.
Rob, J. W. Lancet, 1906, i, 1751.
Rogers, John. Arch. Pediat., 1906, xxiii, 387.
Sarvanot. La Press Med., August, 1905, 536.
Sarvanot. Brit. Jour. Chil. Dis., 1906, iii, 124, 364.
Schmidt. Münch. Med. Wochen., 1905, ii, 308.
Scudder, Chas. L. Jour. Amer. Med., xliv, 1665.
Scudder, Chas. L. Prov. Med. Jour., 1906, vii, 84, 85.
Scudder, Chas. L. Vermont Med. Monthly, 1906, xii, 49.
Scudder, Chas. L. Bost. Med. & Surg. Jour., 1907, clvii, 321.
Stiles, H. J. Brit. Med. Jour., 1906, 946–948.
Still, Geo. F. Lancet, 1905, i, 632–635.
Sturmdorf, A. Arch. Pediat., 1906, 388.
Thompson, Geo. F. Surg. Gyn. & Obs., 1906, iii, 521.
Torian, O. N. Indiana Med. Jour., August, 1907.
Wachenheim. Am. Jour. Med. Sct., 1905, cxxix, 636.
Williamson. London & Edinburg Monthly Jour. of Med. Sci., 1841, 23.

THE USE OF STERILE OIL TO PREVENT INTRAPERITONEAL ADHESIONS[1]

A Clinical and Experimental Study

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INTRAPERITONEAL adhesions may be produced — 1. By sepsis; 2. By destruction or complete removal of portions of the peritoneum; 3. By severe or long-continued irritation, even though this irritation be occasioned by a substance originally sterile.

So far as possible, surgeons scrupulously avoid these causes, and, when it is impossible to eliminate them, have endeavored to minimize their undesirable sequels — 1. By carefully covering denuded surfaces by peritoneum, occasionally by omental flaps or grafts; 2. By the use of cargile membrane or similar sterile absorbable substances; 3. By introducing salt solution, or salt solution and adrenalin, into the peritoneal cavity before closing the incision (Marvel, J. A. M. A., Sept. 21, 1907).

In spite of these efforts, adhesions, often a troublesome legacy, and not infrequently a dangerous possession, are a common sequel of abdominal surgery.

The object of this inquiry was to determine whether sterile oil possesses qualities which are capable of diminishing these dangers.

I am informed (by Dr. H. A. Lothrop) that Martin, of Berlin, was in the habit, fifteen years ago, of moistening his sponges in oil and rubbing them lightly over the peritoneum and intestines in certain cases, just before closing the abdominal incision. I have been unable to find any article by Martin referring to this practice, though it is undoubtedly true that his effort was to avoid adhesions.

It has been impossible to discover anything in print upon this subject; and it seemed desirable, therefore, to ascertain, in the first place, whether oil introduced into the peritoneal cavity is capable of doing damage. It is the belief of competent histologists that the peritoneum of the cat is, in essentials, similar to that of man, and its behavior in relation to possible irritants is, therefore, practically the

[1] Read before the American Surgical Association May 5, 1908.

same as the human peritoneum. If, therefore, considerable quantities of oil introduced into the peritoneum produced undesirable effects upon cats, we might fairly infer that proportionate quantities would produce as bad, if not worse, effects if introduced into the peritoneal cavity of a man. And, if in the cat undesirable effects were entirely lacking, it would be a fair inference that in the case of man, smaller proportionate amounts of oil would be equally harmless. This first step was deemed essential, because in recent years several radical measures have been proposed and utilized in abdominal surgery, which previous appropriate animal experimentation would, almost certainly, have shown to be inefficient or actually dangerous.

The fact that the peritoneum of cats is probably more resistant than that of man to common forms of infection, does not affect the validity of this argument, since, in all cases, the amounts of oil introduced into the animals were far greater proportionately than the amounts which would be necessary to use in human patients; and, similarly, the amount of trauma deliberately inflicted, was far greater than would occur in the average abdominal operation.

The hope that oil might diminish the formation of adhesions was based upon the following assumption: absolutely sterile oil probably remains in the peritoneal cavity for a considerable time; though it presumably collects gradually in the lowest portion of the cavity, it still leaves a thin coating over the peritoneum, with which it is brought in contact; being slowly absorbed, this layer stays in position, and tends to diminish the early adhesions which would otherwise occur; these adhesions are favored by the fact that, after handling and operative trauma, the normal motions of the intestines are diminished; during this early post-operative period, oil would naturally be more effective than salt solution in preventing accurate approximation of peritoneal surfaces, which necessarily precedes the formation of the adhesions. If, therefore, oil can be shown to be free from immediate or remote toxic action, when introduced into the peritoneum, it seemed probable that it would actually diminish adhesion formation.

Observations were made upon two groups of cats — eight operations on four cats late in 1906, and the operations on six cats in 1907. Oil has also been used on seven patients.

It was hoped that, whatever the result, the operations upon cats would be final and conclusive, since they could be controlled in a manner impossible in human beings.

Starting with the fact that the peritoneum of the cat is sufficiently like that of man to react similarly to similar irritants, and that it is less easily infected, the first step was to introduce oil into the peritoneal cavities without attempting to produce adhesions. To this maneuver, both groups of cats gave identical results. The procedure in four cases was as follows: Olive oil (so called) was procured from a grocery-store, and sterilized in small, wide-mouthed bottles, being boiled for, at least, an hour in an old-fashioned Arnold sterilizer. About 10 c. c. of the sterile oil was injected into the peritoneal cavity of each of two cats; one of the cats was etherized, the abdominal wall shaved and sterilized by scrubbing with soap and water, followed by alcohol; in the other, the cat was not etherized and the hair of the abdomen was washed with alcohol, but not shaved; in both cases the oil was injected from a sterilized antitoxin syringe. (It is probably safer in an experiment of this sort always to etherize the animal.) Neither of these animals showed any effects, either local or general, from this operation. So far as could be observed, they remained in all respects exactly as before.

After an interval of five days, one of these cats was etherized, the abdomen shaved and sterilized and opened in the median line above the umbilicus. Traces of oil were found covering the peritoneum; the presence of oil was demonstrated by touch and by the microscope, and the finding confirmed by Professor Theobald Smith.

From 1 to 3 drams of sterile oil was now poured into the general peritoneal cavity, and distributed freely over the viscera. The incision was closed in layers with catgut, including peritoneum and transversalis fascia in one layer, and skin and superficial fascia in the other, the wound being covered with sterile absorbent cotton held in place with collodion. The convalescence was uneventful, the wounds healing by first intention.

A second cat was etherized March 27, 1907. The abdominal hair was removed with a laboratory preparation of barium and starch (which, after being spread over the hair in a layer about one-sixteenth inch thick, and allowed to stay for five minutes, is wiped away with a damp cloth and the hair goes with it, leaving a smooth, unirritated skin). In this case the abdomen, by mistake, was not cleaned with alcohol after the barium paste, but was simply wiped with water from the faucet.

A median incision was made, one ounce of sterile oil poured in until it flowed over the edges of the wound, which was immediately united by catgut in two layers, as usual. This cat was noted to be a little dull and "sick" on the following day (quiet and did not eat), but after that was normal again.

These four operations represented the inquiry, "Does sterile oil in (comparatively) large quantities introduced into the peritoneal cavity, either by subcutaneous or by the open method, do harm either locally to the peritoneum or indirectly to the system in general?" Three of the cats were absolutely normal in the post-operative course; one in which a very large amount of oil was introduced seemed dull for a single day, but no more so than frequently occurs after simple abdominal operations in which oil has not been used. It may, therefore, be concluded that *absolutely sterile* oil introduced in moderate quantities into the peritoneal cavity of cats is not a source of danger to these animals.

ADHESIONS

It is assumed that, if the peritoneum be removed or destroyed and the denuded areas permitted to remain in contact, adhesions will usually occur, even in the absence of the least demonstrable degree of infection. In practice, however, we must accept the fact that absolute asepsis is not attainable and that there is a varying, but usually slight degree of infection accompanying every surgical operation. We may, therefore, assume that all adhesions have an element of sepsis in their etiology, though that element may be extremely small; and that some adhesions are due primarily to sepsis and secondarily to trauma, while in others the reverse is true. It is the latter class which has been studied, for two reasons: First, it is difficult to cause in cats sepsis which will produce adhesions and not kill the cat; Second, because it seemed desirable to inquire whether trauma accompanied by the least possible sepsis would, as a rule, produce adhesions.

TECHNIQUE

Cats etherized with a small cone, no food for twelve to twenty hours before operation. At site of operation the hair clipped (occasionally shaved), and the skin washed with soap and water, and alcohol; operator's hands scrubbed with soap and water, and alcohol; no gloves; sterile single sheet; sterile gauze sponges; instruments boiled five minutes; knives in alcohol; sutures in tubes.

Experiments in relation to adhesions number seven in the recent group and five in the former. The technique was roughly identical in eleven cases; the twelfth being a pyloroplasty after the method of Finney. Median incision above umbilicus; the anterior surface of stomach and of that portion of the liver area normally in contact with the anterior abdominal wall, together with the abdominal peritoneum of corresponding area, was scraped vigorously with a scalpel until slightly oozing blood appeared. In one half of the cases, oil was poured directly into the peritoneal cavity and this was followed by immediate suture in layers without drainage; the other animals were immediately closed after scraping the peritoneum, but no oil was introduced into the cavity.

With a single exception, all the animals lived and seemed as well as before operation. The exception was a cat who died after three days, having refused food from the first; autopsy showed a generalized peritonitis with a serous exudate in which small, whitish flakes were suspended; there were *no adhesions between the peritoneal surfaces.* This cat was, of course, infected at the time of operation. The other cats lived for periods varying from weeks to months and grew fat and healthy; at the autopsies conditions were found which are summarized in the following conclusions:

1. Under these circumstances, adhesions may take place along the line of incision, and

along the denuded areas. Simple scraping of the peritoneal surfaces of adjacent visceral and parietal peritoneum is sometimes insufficient to cause lasting adhesions; usually such adhesions form, if oil is not used.

2. Sterile oil does not always prevent the formation of adhesions, after the procedure outlined above. An analysis of these cases does show, however, that there were fewer adhesions, and, as a rule, less extensive and less dense in those cases in which oil was used. In the pyloroplasty, involving necessarily considerable trauma as well as intestinal suture, adhesions were of moderate extent and fairly firm after an interval of 28 days.

There remain observations upon seven patients; quantities of sterile oil, ranging from 1 to 3 drams, were either poured directly into the peritoneal cavity or applied on a sponge; 5 were cases of appendicitis; one a case of extensive adhesions, one a diffuse peritonitis; 6 were acute, one a secondary operation for symptoms persisting after an operation in which an abscess was opened, but the appendix not removed. Of these, one was done by Dr. H. A. Lothrop, two by Dr. David Cheever, and four by Dr. J. B. Blake. Five had a convalescence which was uneventful; it seemed to me that three of these had less pain and discomfort than might have been expected from the conditions found; certainly the oil did not appear to have the slightest undesirable effect, locally or generally. The diffuse peritonitis died, as was expected, without any obvious effect, good or bad, from the oil. In two cases, there were unpleasant symptoms which require consideration. In Dr. Lothrop's case, in the effort to remove a previously inflamed appendix, then embedded in adhesions, these adhesions were extensively broken up, and the appendix finally removed, almost by morcellation. The oil was applied on sterile sponges. For three or four days after this, the patient was seriously sick with fever, increased pulse rate, local tenderness, moderate distention, and the signs of an acute local sepsis; there was nothing to indicate fat embolism or any general disorder, save that arising from a local inflammatory focus. Two possibilities present therefore: either the oil was not sterile, or the adhesions, which were broken up, covered some gross or microscopic pockets of infection. In either event the oil, as such, is obviously not the etiological factor. In the second case (my own), a delicate woman was operated on the fourth day of a suppurative appendicitis. A gangrenous appendix was removed close to the cæcum; oil was poured into the wound before the large cigarette drain was introduced. The patient has had a sinus which has never completely healed (three years) and which connects with the bowel; tuberculous peritonitis is suspected; operation is refused; it is not possible that the oil played an etiological rôle in this case.

Dr. Lothrop's case suggests, however, the one positive danger of using oil in the peritoneal cavity; it is, of course, the danger that accompanies the introduction of anything into that cavity, i. e., the danger of sepsis. Oil is not thoroughly sterilized by some methods in common use (Theobald Smith); these experiments show that oil may remain in the peritoneal cavity for more than one, and perhaps as much as, three weeks; the greatest care must be used in sterilizing the oil, therefore, as this seems to be the only danger in its use. It should be boiled for a minumum of an hour.

CONCLUSIONS

From these experimental and clinical data it is fair to assume that oil, absolutely sterile, may be used in the peritoneal cavity of patients in moderate quantities 1 to 4 drams without danger, general or local; that it remains in the peritoneal cavity for periods of from five to fifteen days, and possibly even longer; that its presence tends to prevent early and direct adhesion of denuded or inflamed peritoneal surfaces, and, therefore, that its use, under the above precautions, is indicated and is moderately effective in sometimes preventing and usually diminishing the formation of post-operative peritoneal adhesions.

PELVIC ABSCESS WITH SPECIAL REFERENCE TO RECTAL DRAINAGE

By ARCHIBALD MacLAREN, M. D., St. Paul, Minnesota

THE problem of how to deal with pus in the pelvis has been practically solved in so far as the woman is concerned; all intraperitoneal collections of pus — with the exception of tubercular inflammations — whether from cellular tissue, appendages, uterus, or appendix, can be cured by vaginal section, in the vast majority of cases.

My experience is drawn from the histories of 210 pelvic abscesses treated by vaginal section, reported in St. Paul Medical Journal, of January, 1908. Of this number, 20 were recognized at the time of the original operation as due to suppurative, perforative appendicitis, and nothing was done at the time of the original operation but to open and drain the abscess through the vagina, leaving the appendix to be dealt with at some subsequent time. In three of these cases the appendix continued to give so much trouble that it was removed in the next ten days. All of these 20 appendiceal cases recovered. My further observation has been that not more than 20 per cent of all pus cases, including pus tubes and suppurating ovarian cysts, need more than a single vaginal section with tube drainage; and that very few cases, comparatively, find it necessary to have a later laparotomy and removal of appendages; and that at least five per cent of the large pelvic abscess cases are so perfectly cured, that they have later been successfully delivered of living children.

In the pelvic abscess of men we have a slightly different problem, for here, to reach and drain Douglas's cul-de-sac, we must go through the anterior rectal wall. The fear of increasing the infection, or of further contaminating the abscess cavity, has held the surgeon back, and prevented for several years his offering the man with a pelvic suppuration the same chance that he would the woman. I can recall many cases of pelvic appendiceal abscess in men and boys, that have been opened and drained in both sides and in both loins, as well as having suprapubic stabs for large glass or metal tubes, who in spite of all these drainage tubes have died. These patients have died of chronic sepsis or amyloid liver because, for one reason, they have not had drainage of the dependent portions of the peritoneum. On several occasions, I have expressed the theory that many of these patients died because the abscess wall had been broken up for the purpose of removing the appendix. I am now inclined to change this opinion, and to conclude that it was because of the presence of pockets of pus imperfectly drained, and that these pockets are usually in the pelvis. These patients are as a rule very sick; they do not stand a prolonged operation well; so that I would still feel that it is unwise to try to remove the appendix in the presence of any quantity of pus.

We all know that, if the abscess be left to itself and if the patient does not die in the process, a certain number will rupture into the rectum and cure themselves; now, when we, as surgeons, step in and take off the pressure in this abscess cavity by opening it from above, we lessen the chances of nature's best cure. It was Dr. Jepson, of Iowa, if I remember correctly, who lately described a method of drainage to meet this difficulty; after opening an abscess case in the right McBurney point, with the finger inside to guide him, he makes an opening into the cul-de-sac beside the bladder and outside of the ureter, close to the rames of the pubes, and puts in a tube drain. The objection to this method, which I would make, is, that it does not drain the most dependent portion of the peritoneum, and that there is too much tissue disturbed, and that rectal section is a much easier, safer, and better method.

These pelvic abscesses which we are here discussing are practically all due to perforative appendicitis. Of course, we may have abscess following perforation of any other abominal organ, but the vast majority will follow acute perforative appendicitis.

If we might be so fortunate as to see and recognize all acute cases of appendicitis before rupture of the appendix, this question would

not need to be so important. But after rupture, the omentum and the adhesive peritonitis usually wall off the pus and keep it in the right loin. The edge of the pelvic cavity is very near, and in many cases the pus runs over into the true pelvis, at the time of the original rupture. Many others extend into the pelvic cavity in the next few hours or days.

I am fully impressed with the importance of examining through the rectum every case of acute appendicitis before any operation, for it is very important that the pelvic accumulation should be drained at the time of the first operation with a suprapubic drain, followed by the Fowler position — reserving rectal drainage for the cases who later develop pelvic accumulations or who convalesce badly after any course of treatment; at least, this is the class of cases in which I have felt that it was justifiable to take some risk, and try a new departure.

There is a second class of cases where rectal drainage will prove a great life-saving measure, namely, in all cases of diffuse septic peritonitis after the third day, up even to the time of death itself, I mean the class of cases when we have felt sure that any operative procedure from above would take away the only chance of recovery that the patient had (Oschner). I would give these patients rectal puncture and drainage whether I could feel much bulging of the anterior rectal wall or not.

I have seen more than one of these patients rupture back into their own peritoneal cavities just as it commenced to look favorable for their recovery.

Just as in vaginal section one cannot always feel the fluid bulging, still we know that it is there and exploration with the finger through the rectal opening will allow of your reaching and evacuating of the pus.

I have made a rule of procedure for myself that I will never let a woman die with peritonitis without making vaginal section and putting in a drain because of some such remarkable results following vaginal drainage in my experience in the past two years. I now wish to add that I will hereafter never let a man die of peritonitis without making rectal drainage.

Dr. McArthur, of Chicago, tells me that for several years he has used rectal drainage in men with large pelvic abscess complicating perforative appendicitis.

That since 1893 he has opened and drained about fifteen patients with the greatest satisfaction and no mortality.

Since starting to write this article, I find that this subject has been favorably discussed of late in Paris, and that Dr. George McNaughton, of Brooklyn, advised it in January, 1906, saying that it was a fairly safe avenue of approach in pelvic abscess in men, although he does not give any histories.

And what is the danger from rectal drainage? None at all, according to a limited experience. In my first case, seen with Drs. H. C. and Asa Johnson, of St. Paul, I simply made a rectal puncture, opening into the rectum a moderate sized abscess, which discharged several ounces of pus. The opening closed too soon, but later opened and discharged a pint of offensive pus, when the man promptly recovered and has remained perfectly well, now over six months. Chart I.

In the next case, I followed the advice of my friend, Dr. Arnold Schwyzer, of St. Paul, and over-distended the sphincter, so that there would be no back pressure from the rectum into the abscess cavity, and put in a winged rubber tube, which extended a couple of inches from the anus, and left this in place over a week. Chart II.

In the third case, a patient of Dr. Keams, of St. Paul, I first opened the base of the bladder by mistake in a man very sick with acute septic peritonitis, and put my finger well into the bladder to be sure that it was the bladder and left it open, then immediately opened the cul-de-sac and put in a tube. The same night the man passed bloody urine through the urethra, but had no inflammation, or other bladder trouble. He later coughed up pus from a ruptured subdiaphragmatic abscess and eventually recovered perfectly. Chart III.

The fourth case, a boy of 12 years of age, sent by Dr. Kerr, of Martel, Wisconsin, was operated upon on the sixth day, following a perforation of his appendix. On the tenth day of his disease, I found a bulging of the anterior rectal wall and made a rectal section, letting out fully three ounces of thick, offensive pus. There was considerable bleeding from

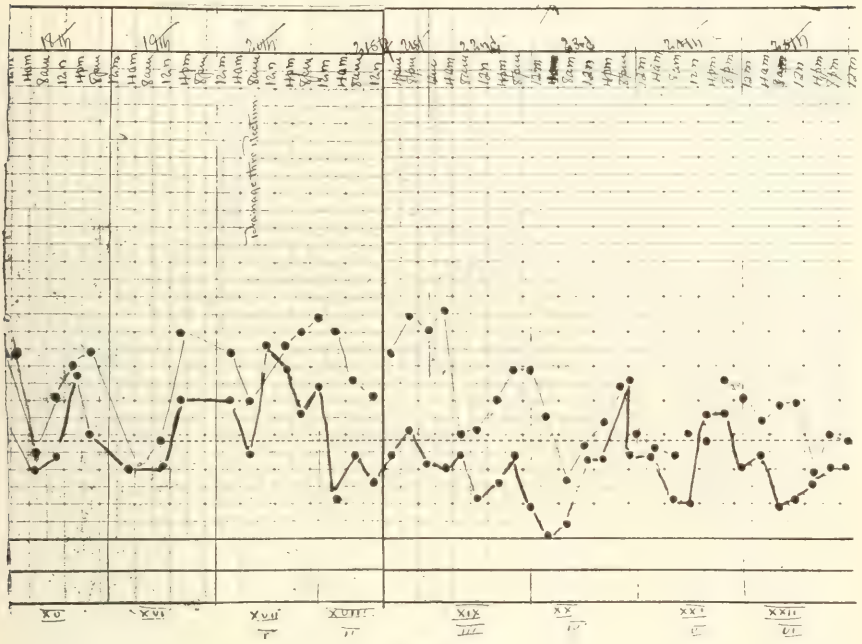
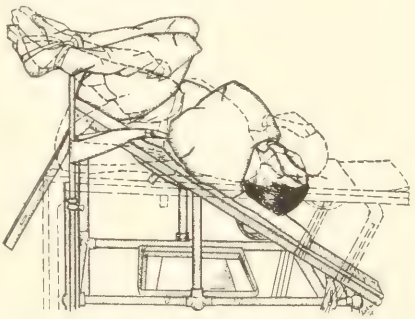


Chart I.

the rectal wall, and that night he showed that he had lost quite a little blood. For several days his temperature and pulse were high, due to a blood infection, and the drainage tube gave exit to considerable black blood. He was slower than any of the others, but it now perfectly well.

In case No. V, I assisted my partner, Dr. H. P. Ritchie, to operate upon a very sick man on the third day after perforation; on the tenth day Dr. Ritchie put a drain in the rectum. This man was much disturbed with a high temperature and pulse for about ten days, but in the end recovered perfectly.

And now as to the method of procedure: The exaggerated lithotomy position (Pryor), the one usually used in making examinations of female bladder with the cystoscope. The most important part of this position is the use of straps over the shoulder, fastened to the uprights holding the feet, to prevent the shoulders slipping away when the head of the table is dropped. I have found that a weighted vaginal speculum will expose the



Pryor Position.

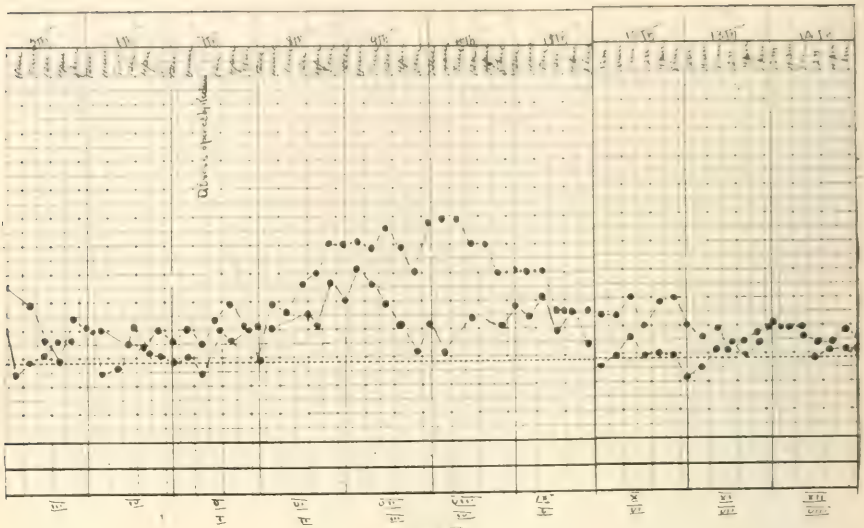


Chart II.

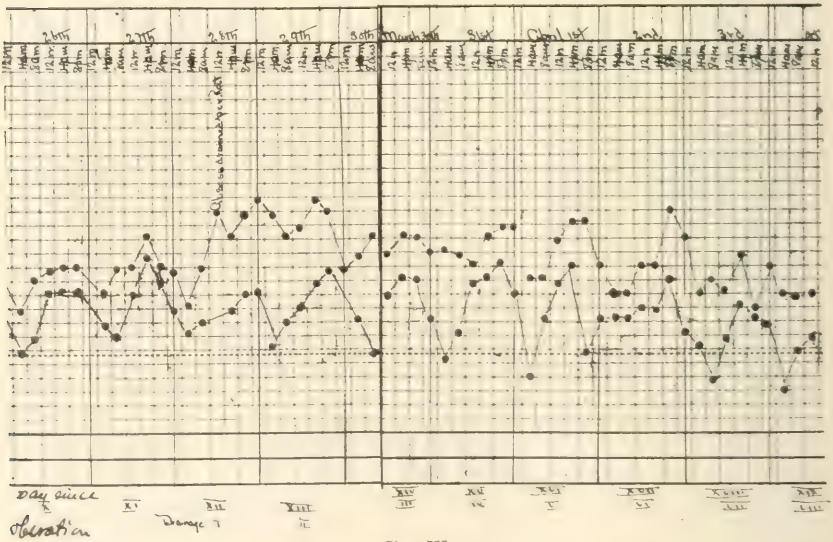


Chart III.

anterior wall of the rectum fully as well as is usually done in the similar operation for vaginal section.

One long bladed retractor for the anterior wall is necessary to hold the bladder out of the way. The bladder having been catheterized to prevent accident (a thing I omitted to do in the case related), then irrigate the rectum until fæcal matter is removed, then sponge it out with alcohol. After the rectum has been well cleaned and the bulging anterior wall well located, open the abscess with either long dissecting forceps or a tenaculum and long, sharp pointed scissors; after opening the cul-de-sac and letting out the fluid, keep the scissors in place until a dilator can be passed upon them as a guide; then keep the dilator in place until one can pass a $\frac{1}{4}$ inch rubber winged tube well up into the cavity, then again dilate the sphincter.

My attention has lately been called to a combination trochar and dilator, for use in vaginal puncture. There are comparatively few vessels in the posterior vaginal wall, but as is shown in Case No. IV, there is some danger of hæmorrhage following rectal section, more I am sure than in vaginal section, so that I am inclined to believe that in these cases the lesser procedure of rectal puncture would be the operation of choice.

Vaginal puncture I do not like; it is too blind and does not give sufficient room for further exploration, but in these cases, all that is necessary is an opening through which to pass a drainage tube.

It has been a great pleasure to see the relief and comfort which these patients have received from rectal drainage, and to note the rapid drop of temperature and pulse which followed this very insignificant operation.

THE DIAGNOSIS AND TREATMENT OF KIDNEY-STONE[1]

By ARTHUR DEAN BEVAN, M. D.
[illegible]
AND
JOSEPH F. SMITH, M. D.
Associate in Surgery

THE subject of this paper is the diagnosis and treatment of kidney-stone. In a brief paper one would not have the time to review fully the history of kidney-stone surgery, as the history alone of this subject would furnish an interesting discussion. We must content ourselves with mentioning merely the landmarks of its development. For many years, stones were occasionally removed from suppurating kidneys by lumbar incision. Not until 1880, was a stone removed by incision through the tissue of a fairly normal kidney; this was done by Henry Morris, of England. From 1880 until 1897 or 1898, a number of operators followed Morris's lead and, in 1898, Morris could report 34 nephrolithotomies with fortunately but one death. The men who contributed most to this development were, besides Morris, Tuffier, Rovsing Israel abroad, and in America, Charles T. Parkes and Christian Fenger. The work done from 1880–1898 was brilliant, in a way, but was unsatisfactory because of the uncertainties of diagnosis. During this period a large proportion of the operations were exploratory, and many of the operations undertaken for stone proved to be for tuberculosis, neoplasm and other pathological conditions. In the last ten years, that is the period from 1898 to 1908, there has been a great development in the surgery of the kidney, thanks to the introduction of the X-ray, and means of collecting the urines separately, and other refined means of diagnosis — cryoscopy, etc. Of these, the X-ray has been by far the most important.

These newer means of diagnosis have re-

[1] Read before the American Surgical Association, May 8, 1908.

sulted in an enormous increase in the number of cases discovered and operated upon and, with better technique, have resulted in increasing the percentage of recoveries and the number of complete and permanent cures.

A word in regard to pathology and natural history of kidney-stone. Of all the possible factors which have been discussed, heredity, water, food, rachitis, gout, rheumatism, diseases and injuries of spine, etc., the most important is probably that of infection.

The stone-bearing catarrh of Meckel, which has comparatively recently been again emphasized by Ebstein, is probably the essential cause in stone formation. This becomes more certain when we discuss the subject of calculus formation in general, i. e., gall-stones, salivary calculi, etc. I take it as proven that infection of a catarrhal, and not a suppurative, type is the essential cause of gall-stone formation, the germ forms being probably typhoid and colon, as a rule. And I believe that the same is true of urinary calculi in general. As a strong argument in favor of this position, I would cite the fact that, in more than half of the cases of fracture of the spine with resulting hemiplegia, stone either in the kidney or bladder is found, if the patient survives the injury for a year or more. We know how frequently, how in fact, almost invariaby the urinary tract becomes infected in these cases. And this infection is, I believe, the cause of stone formation. The common germ forms are probably here, as in gall-stone, colon and typhoid and probably staphylococcus, gonococcus, etc.

In order to produce the so-called primary stones, that is, stones without evident pus formation, the character of the inflammation must be catarrhal and not suppurative.

In about one-half of the cases there is but single stone; the number may run into the hundreds. In probably 20 per cent, or more, of the cases both kidneys are involved.

The size of the stone varies from the size of a grain of wheat, or less, to two or three pounds in weight, as reported by Lee, Potel, and others cited by Garré.

When there is but a single stone, it is usually oval or spherical, or may be branched to fill the pelvis and calices; sometimes a stone in the pelvis will have a horn-like projection passing into the upper end of the ureter. As a rule, the stones found in the ureter are formed in the kidney; they may, however, grow in the ureter and form long, cucumber-shaped stones filling a dilated ureter for several inches; their shape being controlled by the shape of the ureter.

I shall not go into the details of the chemical formation of stone, simply reminding you of the fact, that the many substances found normally in the urine may enter more or less into their composition. Uric acid and urates, oxalates, phosphates, carbonate of calcium, and the rarer forms xanthin, cystin, indigo, etc.

Stones may remain in the kidney for years without causing symptoms. They may, when small, be passed through ureter, bladder, and urethra with complete recovery of the patient.

They may ulcerate into the duodenum or colon or through the kidney, leading to perinephritic abscess, or into the peritoneum, leading to peritonitis. They may lead to the destruction of the kidney so that it becomes changed into a pus sac, or to complete atrophy of kidney tissue with the stone left in a mass of fat, which surrounds it. They may favor the location of tuberculosis in a kidney and possibly, as do gall-stones, by chronic irritation lead to the development of carcinoma. A stone in one kidney may lead to cystitis, ascending inflammation of the other kidney, and fatal termination. A careful examination of cases in which but one kidney is involved leads to the conclusion that, when the stone has existed for some time, the other kidney shows some evidence of chronic change.

When, on account of stone, a kidney becomes practically destroyed, the other kidney undergoes a compensatory hypertrophy sufficient to carry on the kidney function of the body.

Some of the results of stone are, chronic sepsis, amyloid changes in internal organs, marked secondary anæmia from hæmorrhage, and even fatal hæmorrhage, calculous anuria, either due to stone in the ureter of a single kidney or stones in both kidneys or stone in one kidney blocking up ureter and reflex anuria on the other side.

The ordinary picture of kidney-stone is that

of kidney colic of greater or less frequency, with pain in kidney region and radiating from this region; blood usually microscopic, sometimes, however, in large amount in urine, and pus, with not infrequent bladder symptoms due to a resulting or accompanying cystitis.

The differential diagnosis must be made between stone and tuberculosis and neoplasms of the kidney, kidney infections and displacements, and such rarer conditions, as essential kidney hæmorrhage and polycystic degeneration of the kidney, and various lesions of other organs, as gall-stone disease, appendicitis, ileus. Sometimes it is by no means easy to make the differential diagnosis without an exhaustive study. I have seen kidney-stone colic produce the typical picture of ileus. I have seen appendicitis produce the typical picture of kidney colic, accompanied even by a considerable amount of blood in the urine. I have four times removed the appendix in the interval on the strength of the diagnosis made by well-qualified men, who had taken care of the patients during the attacks, and found not appendicitis but kidney stone.

DIAGNOSIS

1. *History.* A careful history of the onset, character and duration of attacks may often be of great value in making a probable diagnosis.

2. *Pain* in some degree occurs in practically all calculus cases. Pain is, however, a frequent accompaniment of non-calculous diseases of the kidney, and for this reason is not of great diagnostic value. That nephrolithiasis may occur without pain, is shown by the report by Clark (quoted by Brewer) of 24 autopsies on calculus cases, 13 of whom had had no pain.

The size of the stone has no definite relation to the character or amount of pain. Large calculi occupying the pelvis of the kidney may give little or no pain. On the other hand, small rough stones that make their way into the ureter may cause the most agonizing pain.

Palpation of the kidney may be of value in calculus cases, although generally the findings are negative. Rarely, on palpation, crepitus produced by fragments of stone rubbing together may be felt. The kidney is often enlarged and tender. Israel has described a reflex irritability with rigidity of the ureter in calculus cases, causing the ureter to feel like a firm cord when palpated through the rectum or vagina.

3. *Hæmaturia.* The amount of blood in the urine may vary from a few corpuscles, found by microsopic examination of the centrifuged specimen obtained during or after an attack, to large and even fatal hæmorrhages.

Cunningham found hæmaturia 22 times in 48 cases.[1] Brewer found blood present in 45 per cent of calculous cases, and also in 41 per cent of non-calculous renal diseases. Hæmaturia, especially occurring in microscopic amounts during or after an attack of renal colic, is a finding of considerable importance in establishing a diagnosis.

4. *Other urine findings*, such as renal sand, crystals, small calculi, fragments of calculi, renal or ureteral epithelium, leucocytes often seen in clumps, macroscopic pus, are findings of importance. Cunningham (quoted by Brewer) found pus 39 times in 48 cases reported.

5. *Vesical tenesmus* or rectal tenesmus are frequently felt when a stone is moving in the lower portion of the ureter, cystitis frequently accompanies the pyelitis and ureteritis set up by a stone in the pelvis of the kidney or in the ureter and gives rise to frequency of micturition. Occasionally, a stone in the lower portion of the ureter can be palpated per rectum, or per vaginam in the female.

6. *Leucocytosis* is often present in the infected cases and depends upon the degree of infection and amount of septic material absorbed. Chills and irregular temperature may also characterize the severely septic cases.

7. *Cystoscopy* and ureteral catheterization.

Cystoscopy may be of great value in calculous cases. A stone impacted in the ureteral orifice may be seen protruding or causing prolapse, widening, or œdema of the ureteral orifice, and a ureteral bougie passed into the ureter may give definite evidence of obstruction.

The wax-tipped bougies used by Kelly when passed into the ureter may show scratches produced by contact with a stone.

This method is applicable only in the female

[1] [illegible]

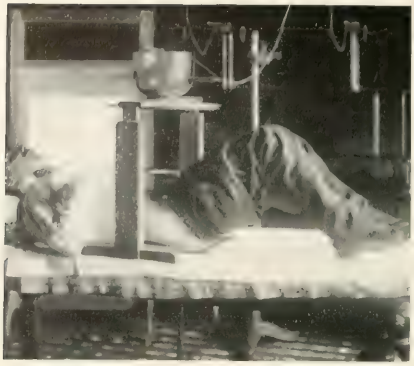


Fig. 1. Apparatus arranged for taking a general view of both kidneys, both ureters, and the bladder.

and by the direct cystoscopy, as practiced by Kelly. Wax-tipped catheters do not give reliable information, when used with the European cystoscopes, because of the scratches produced by the instrument through which the bougie is passed.

Examination of the ureteral orifice will often show from which side the blood or pus is coming and catheterization of the ureters enables one to obtain the separated urines and examine them for blood, pus, bacteria, epithelium, etc., as well as to determine the functional capacity of the two kidneys.

8. *Functional tests.*

Leik[1] reports 10 cases of renal calulus in which the functional capacity of the two kidneys was determined. He found the functional capacity of the affected kidney lessened in all cases, even the mild aseptic cases showing marked diminution of the functional power. Of the various methods that have been employed in determining the functional capacity of the kidney, the following are the most reliable and easy of application:

a. The indigocarmine test made by injecting 5 to 10 c.c. of sterile indigocarmine solution into the gluteal muscles, introducing the cystoscope twenty minutes after the injection, and observing the rhythmical puffs of deep blue colored urine as it escapes from the ureter. In this manner the ureteral orifices can be located, in cases in which they are difficult to locate by simple cystoscopy, and the fact as to whether or not both kidneys are excreting established. By some observers the time required for the blue color to appear in the urine and the intensity of the color are regarded as being of value in determining the functional capacity of the kidneys. Since it has been shown, however, that normal kidneys vary in their power to excrete this coloring matter, it is doubtful whether or not this test is of much real value in determining functional capacity.

b. The phloridzin test, described by Casper and Richter, depends upon the fact that when phloridzin is injected subcutaneously, glycosuria appears in 15 to 30 minutes in a healthy condition of the kidneys and continues from 1 to 3 hours. The test is made by injecting subcutaneously 1 c.c. of a sterile 1 per cent solution of phloridzin and testing the urine for sugar at intervals of five minutes by Fehling's or Haines's solution. Kapsammer maintains that this test gives reliable information as to the excreting power of the renal parenchyma and that, when sugar appears in the bladder urine in 15 or 20 minutes after the injection, the functional power may be considered normal, whether one kidney or both are active. In

Fig. 2. Apparatus arranged for taking a circumscribed area by means of the compression diaphragm.

[1] Archiv. für klin. Chirurg., Bd. 85, Heft 2.

Fig. 3. Typical skiagraph taken with compression diaphragm, showing several large and small calculi in the pelvis and parenchyma of the kidney.

cases in which the reaction is delayed 30 minutes or more, the functional capacity may be regarded as decreased.

By collecting the separate urines and testing each at five-minute intervals after the injection, the functional capacity of each kidney may be determined. In normal conditions of both kidneys, sugar appears simultaneously in the urine from both kidneys and is excreted in equal amounts. If one kidney is diseased, and the other sound, the phloridzin glycosuria is delayed in time and lessened in amount on the affected side and appears in the usual time and amount on the sound side.

c. Cryoscopy, described by Koranyi and recommended and much employed by Kümmel and others, consists in the determination of the molecular concentration of the blood serum and urine by measuring the freezing-points of the blood and urine. It depends upon the fact that in health the blood maintains a definite degree of molecular concentration, and has a practically constant freezing-point, 0,55 to 0,57°. The excreting power of the kidneys is the most important factor in maintaining the constant molecular concentration of the blood. In conditions in which the renal parenchyma is damaged and the power of excretion lessened, the molecular concentration of the blood increases, on account of the accumulation of salts in the blood, and the freezing-point is lowered to 0,60°, or lower. Cryoscopy of the blood, therefore, seems to give us definite and valuable information as to the total renal functional power. It does not give us any information as to the relative capacity of the two kidneys. Cryoscopy of the urine seems to be of little practical value, not more than a determination of the specific gravity, according to Kapsammer.

Fig. 4. Skiagraph of very large stone in the pelvis of the kidney. Photograph of stone shown in Fig. 5.

9. *Röntgen examination.*

The introduction of the Röntgen rays as a means of diagnosis marks the most important advance made in the surgery of renal and ureteral calculi in modern times. The present improved technique has rendered this means of diagnosis sufficiently accurate to entitle it to rank with other commonly employed means of diagnosis of generally recognized value, such as the examination of sputum and urine for tubercle bacilli, fæces for blood and parasites, etc.

The accuracy of the method depends upon the skill and experience of the operator making the examination and the interpretation of the plate, the efficiency of the apparatus at hand, and the technique employed. The following reports show the percentage of correct diagnoses as reported by the several observers in their own work:

		Cases.	Correct.
Kümmel and Rumpel	1903	18	100%
Smith and Bevan[1]	1904	27	96%
Leonard	1907	350	97%
Brewer	1908	57	78%

The apparatus employed generally consists of an induction coil capable of giving a secondary spark from six to twenty inches in air. The spark length is less important, however, than the amount of current measured in milliamperes passing in the secondary of the coil, since the number of milliamperes passing represents the amount of energy available to be transformed by the tube into Röntgen rays. The tube is, however, the most important part of the

Fig. 5. Photograph ½ size of stone shown in the skiagraph in Fig. 4. The stone was broken in removal.

equipment. It should be capable of adjustment to the particular case in hand and, also, be capable of carrying, for a sufficiently long period of time, the necessary amount of secondary current to produce sufficient Röntgen rays to secure proper penetration of the tissues.

The shadows produced by calculi of various compositions vary widely in density. Urate and uric acid stones produce almost no shadow, even when placed directly upon the photographic plate and exposed to Röntgen rays. Fortunately, pure urate or uric acid calculi are of rare occurrence, enough oxalates, phosphates, carbonates generally being present to given shadows on the plates.

The phosphatic calculi are second in point of density and the oxalates third, being the most dense, and therefore giving the most definite shadows of any of the ordinary forms of urinary concretions.

The preliminary preparation of the patient for the Röntgen examination is important, especially the thorough emptying of the gastrointestinal tract. This is best accomplished by giving a brisk saline cathartic the night before, and a colonic flushing in the morning. The patient should eat no solid food for 12 to 18 hours before the examination, the peristaltic motions of the bowels as well as the bowel contents interfere considerably with the clearness of detail in the plates. This fact has been shown by taking plates of cadavers and comparing them with plates obtained from the living subject.

Since the clinical symptoms give but little information as to the exact location of calculi in the genito-urinary tract, it is desirable to first secure, if possible, a plate showing the region of both kidneys, both ureters, and part of the bladder, as shown in Fig. 1. For this purpose the patient lies on his back, with head and knees elevated, so as to straighten the spine and bring it in contact with the plate. The tube is inclosed in a heavy lead glass tube shield, and supported upon a stand 26 to 30 inches high, with telescoping sides, permitting a greater elevation, if necessary. The top of the stand carries a circular piece of heavy sheet-lead, with an opening in the center for diaphragms of various sizes. This heavy lead disk cuts off the stray rays from the walls of the tube and the diaphragm opening limits the rays that are to be used to a cone of approximately parallel rays. A satisfactory plate should have the following characteristics:

1. It should show the lateral processes of the vertebræ to the tip.

2. It should show the structure of the last two ribs.

3. It should show the border of the psoas muscle.

The importance of this general view of the entire genito-urinary tract is very great, in view of the fact that the clinical symptoms are often most misleading, as to the location of the calculus. Several cases have been reported in which the symptoms pointed to a calculus on one side, but the Röntgen rays showed the location to be on the opposite side. The writer has had this experience in two cases. In both cases there were severe symptoms referable to the right side, while the Röntgen rays showed the presence of a calculus in the lower portion of the ureter on the left side.

After a satisfactory view has been obtained,

Fig. 6. Typical skiagraph showing several stones in the pelvis of the right kidney.

if there are any evidences of stone in any particular location, other plates of that portion should be made, using the compression diaphragm apparatus as shown in Fig. 2. This method, first introduced by Albers-Schönberg, has the advantage of giving clearer and more definite pictures of a limited area, owing to the fact that the diaphragm renders the rays more nearly parallel, the lead cylinder and shield cut off many stray rays and the compression can be made so as to considerably diminish the amount of tissue to be penetrated by the rays. Fig. 3 shows a typical compression diaphragm view of a kidney containing several calculi.

Some of the enthusiastic workers in the field of Röntgen diagnosis believe it is possible to demonstrate by this method the presence or absence of a calculus in all cases.

The difficulties presented in certain classes of cases would hardly seem to warrant the statement that negative findings with the Röntgen method can be entirely relied upon to exclude the presence of stone, especially in the following group of cases:

1. Those in which the calculi are entirely or almost entirely made up of uric acid or urates. It has been demonstrated that even fairly large concretions of uric acid and urates do not make a visible shadow, even when exposures are made through very thin masses of tissue.

2. Cases with thick, fat abdominal walls, with much fat in the omentum and mesentery. Fat, flabby individuals are far more difficult to skiagraph satsfactorily than muscular individuals of the same thickness, perhaps owing to the greater diffusion of the rays by fatty, than by muscular tissues. This difficulty seems very hard to overcome, and a negative diagnosis in many of these cases cannot be made with certainty.

Fig. 7. Typical skiagraph of a single stone in the pelvis of the right kidney.

Fig. 8. Skiagraph showing shadows of small masses of bismuth in the bowel. Patient had been taking medicinal doses of bismuth.

3. Very large calculi or collections of several calculi in the kidney, often give a very indefinite outline, owing to the irregularity of the mass and the variations in its density. Fig. 4 shows the skiagraph of a large stone, with several smaller stones in the right kidney. The outline is very indefinite, notwithstanding the fact that the mass of stones (shown ½ natural size in Fig. 5) weighed over six ounces. Very large, as well as very small, calculi are therefore especially liable to be overlooked.

The cases of ureteral calculus also present some peculiar difficulties that make the diagnosis more difficult than the diagnosis of calculi in the pelvis or parenchyma of the kidney.

In the course of the lower portion of the ureter, shadows are frequently seen that have, in several instances, been mistaken for ureteral calculi, and operations have been performed under the mistaken diagnosis so made, with the result that nothing was found in the ureter but some other condition was present which sufficed to explain the occurrence of the shadows in the Röntgen plates. Among the extraureteral conditions, giving rise to misleading shadows in the plates, may be mentioned:

1. Phleboliths or calcified areas in the walls of the veins in the pelvis.

2. Foreign bodies in the bowel, vagina, or bladder.

3. Calcified appendices epiploicæ.

4. Calcified tuberculous lymph-nodes or tuberculous nodules in the epididymis or seminal vesicles that have become partly calcified.

5. Calcified or osseous areas in the pelvic ligaments. In examining 100 plates of adult pelves taken for various conditions, it was found that in 25 per cent of the plates small, round shadows, varying in size from a BB shot to a pea, occur in the vicinity of the spine of the ischium, frequently bilateral and often multiple. They do not occur in the plates of the pelves of children. The peculiar location of these bodies and their frequent occurrence in both male and female pelvis, renders their explanation as ossified areas in the pelvic ligaments most probable.

These bodies have, doubtless, in many instances, been diagnosed as calculi in the vesical portion of the ureter.

Because of the occurrence of these misleading shadows along the course of the lower ureter, the introduction of a lead bougie, or ureteral catheter carrying a metallic stylet, before taking a skiagraph, has been proposed by several writers, in the hope that by this means extraureteral shadows can be distinguished from shadows produced by intraureteral bodies. By turning the patient slightly and taking two or more views at different angles, the possibility of extraureteral bodies lying in the same anteroposterior plane can be eliminated. This procedure has much to commend it, and should be tried in all cases of suspected ureteral calculus in which the Röntgen plates show shadows along the course of the ureter.

Fig. 9. Skiagraph of pelvis showing single small round calcified nodule in the pelvic ligaments on the right side.

DIFFERENTIAL DIAGNOSIS

Since the clinical picture of renal calculus often closely resembles that seen in other abdominal and pelvic conditions, a careful study of the urine is of the utmost importance in all cases of suspected stone. The final decision in making a positive diagnosis of calculus, must, in the vast majority of cases, depend upon the findings of the Röntgen method. Among the commoner conditions liable to be mistaken for renal calculus are:

1. Acute or chronic appendicitis. In many of the acute appendicitis cases, blood is found in microscopic quantities in the urine. Reliance must be placed upon the skiagraph in many of these cases in making a differential diagnosis.

2. Tuberculosis and tumors of the kidney, ureter, and bladder. The finding of tubercle bacilli, in the tuberculous cases, or fragments of tumor tissue may give positive evidence. In searching for tubercle bacilli in urine, a large quantity must be carefully centrifuged and stained by carbol-fuchsin, using acid alcohol as a destaining agent to avoid confusion with smegma bacilli. Frequently animal inoculations will have to be made before a positive diagnosis can be made.

3. Intermittent hydronephrosis in cases of movable kidney, with kinking of the ureter, may resemble renal calculus. Change of posture, allowing the kidney to slip back into place, relieving the kinking of the ureter, the hydronephrosis and the swelling, may cause disappearance of the symptoms.

4. Acute nephritis, essential renal hæmaturia with blocking of the ureter by clot, may give typical attacks of renal colic. Study of the urine and the Röntgen ray must be relied upon in doubtful cases.

5. Biliary and pancreatic calculi, intestinal obstruction, may be confused with renal conditions, especially on the right side. Careful history, study of the fæces, and careful Röntgen examination will generally serve to make possible a differential diagnosis. Gall-stones seldom give visible shadows with Röntgen rays.

6. Psoas abscess may be mistaken for renal

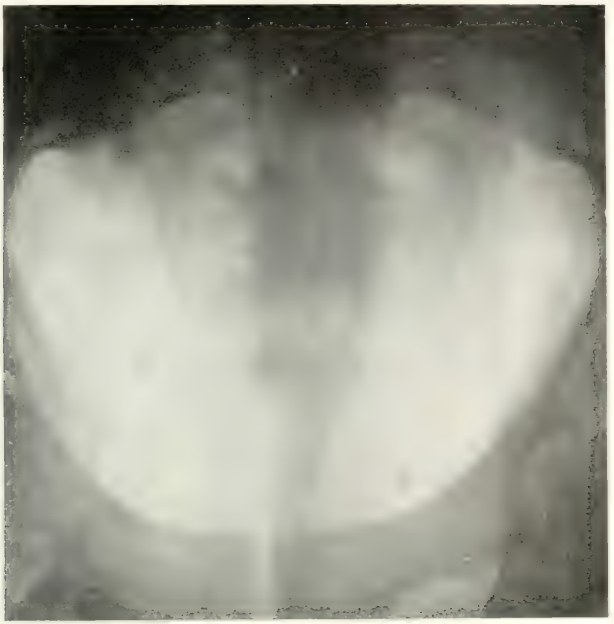


Fig. 10. Skiagraph showing calculus in lower end of left ureter and small round calcified area in pelvic ligaments on the right side.

conditions, especially perinephritic abscess as a sequence of septic calculous disease. Here the finding of a spinal lesion, either by examination or by Röntgen rays, and the absence of shadows of stone in the kidney, will generally make the diagnosis.

When a definite diagnosis of stone is made and the size and position of the calculus are known, I am in favor of surgical removal, except in cases where there is a strong contraindication on account of age or organic disease, or where the stone is so small, that it may be passed by the ureter, bladder, and urethra.

I have had an opportunity of watching a number of cases handled expectantly, and have seen so many serious consequences, such as, attacks of anuria and infection and colic, occur, and injury to the kidney tissue result, that I am satisfied that the dangers of operation are not as great as the dangers carried by the continuance of the condition; and the operation has the great additional advantage of curing the patient, which the expectant treatment seldom does.

To be sure, I have seen a number of cases recover without operation. I recall one in particular; a big, strong fellow, who had a stone a little larger than a coffee bean. We obtained, after a number of exposures, several very good plates confirming the diagnosis. When I first took charge of the patient, I recommended temporarily expectant treatment. The colics recurred, however, and the stone did not pass, so I advised surgical removal. He could not bring himself to an operation and for several years suffered from very severe and frequent colics and had several attacks of serious temporary anuria. He suffered more in any one of a dozen attacks than he would from an operation, and certainly

ran more risk from his anuria attacks than he would have from surgical interference, but he finally passed his stone and rejoiced that he had escaped an operation. It is upon such weak evidence as this that many of the pleas of non-interference are based. Against this man, who was practically invalided for several years and suffered very greatly, I could place a dozen men who were operated on during this same period, who had less pain from the operation than from an attack of colic and left the hospital within two weeks perfectly cured.

There are, to be sure, some conditions which demand immediate action, as calculous anuria, infection etc., where there can be no question about the propriety of surgical intervention. I would plead for the adoption of surgical removal of kidney-stone, not only in these, but in all cases in which the diagnosis is made—and the earlier the better, with some few exceptions, namely, the cases of extreme age and other organic disease making operation extremely dangerous, and the cases with very small stones, which should be given a reasonable time with the hope that they may be passed.

One very strong argument in favor of removing kidney-stones, where they are not producing urgent symptoms, is that of preventing the occurrence of urgent symptoms by removing the stone which, if left, might cause them; and, again, it is perfectly clear that in almost all cases the kidney containing a stone suffers continually from its presence, a more or less chronic change takes place, with impairment of the secreting value of the organ, often leading to total destruction of the kidney tissue. After a definite diagnosis of kidney-stone is made with the X-ray, other conditions warranting, it should be removed.

Where the X-ray shows that there is a single small stone, as there is in the majority of cases, and the clinical evidence does not suggest destructive processes in the kidney, I do not employ the cystoscope or ureteral catheter or make a cryoscopic examination, but proceed at once to the operation. Where the X-ray shows a large stone or mass of stones, and the clinical history and the pus and blood in the urine suggest the possibility of the necessity of a nephrectomy, an exhaustive study of kidney sufficiency must be made, and the absence or presence and condition of the other kidney determined. This can best be done by collecting the urines separately by ureteral catheters and by a cryoscopic examination of the blood.

I am not one of those who believe in the entire harmlessness of ureteral catheterization. I regard it as a possible cause of danger, and as a means of diagnosis, which should be employed only where definitely required and not as a routine procedure. It is, however, frequently indispensable. Where definite information can be obtained by catheterizing the diseased kidney alone, the healthy kidney should not be catheterized; where, however, this can not be obtained, the catheterization of both may be necessary. The cyroscopic examination of the urine I regard as of little value. I believe, however, that under certain conditions the cryoscopic examination of the blood is of distinct value, as already stated. In a case where there is considerable blood in the urine, a normal blood freezing-point, i.e., 0,55 to 0,57°, means kidney sufficiency, and almost certainly the involvement of but one kidney in the diseased process.

Given, therefore, a stone case where the X-ray has located the disease and where the ureteral catheter has demonstrated the presence of another kidney, and with a normal freezing-point of the blood, a nephrectomy can safely be made, if the conditions of the affected kidney, as determined by the operation, warrant. In operating on kidney-stone cases the great frequency of stone occurring in both kidneys, probably in 20 per cent of cases, should constantly be borne in mind. If stone is demonstrated by X-ray in both kidneys it probably would be safer to operate on both sides at the same sitting.

THE TECHNIQUE OF OPERATION

The removal of a single stone of moderate size from the pelvis of a kidney, not greatly injured by the long-continued presence of the stone and by infection, is, as a rule, a comparatively simple operation.

For several years, I have been doing these cases under nitrous oxide anæsthesia.

The patient is put on the sound side with a

good-sized pad under the flank so as to increase the space between the last rib and the crest of ilium on the side to be operated on. A special assistant is detailed to hold the limb of the operated side at right angles to the body. I prefer the pad and an assistant to any of the special tables and supports which have been introduced for kidney work.

If the anæsthesia is a very prolonged one, and sufficient relaxation cannot be obtained from gas, the sequence of gas and ether are employed. The oblique kidney cut, extending from the last rib where it is crossed by the erector spinæ obliquely downward and outward a finger's breadth above the crest of the ileum, is employed. The length of the incision will depend upon the size of the patient and the difficulties of the case. The incision should be of sufficient length to permit the introduction of the entire hand. This incision divides skin, superficial fascia, latissimus dorsi muscle, lumbar fascia, and external oblique and, where it is extended well forward above the crest, the internal oblique and transversalis muscles. The fat capsule is exposed and carefully separated from the kidney so that the kidney may be lifted well up into the wound and freely palpated.

If the single stone is found in the pelvis, the kidney is so held as to expose the posterior surface of the pelvis, and this is freed from fat and areolar tissue with blunt dissecting forceps. The pelvis is behind the renal vessels, so that these cannot be injured if the posterior wall of the pelvis is opened, except in the event of some unusual distribution of the vessels; it is in order to avoid this, the posterior wall of the pelvis should be cleared of fat and areolar tissue, so that one can see that no vessel is injured in incising the pelvis. An incision is now made through the wall down to the stone and the stone extracted. The incision should then be closed with a single layer of fine catgut sutures introduced like Lembert sutures, the kidney dropped back into position and a cigarette drain carried to the point of closure. The external wound is closed with moderate sized catgut through the deep muscles. Through and through silkworm gut and horse hair through the skin. The cigarette drain is removed in three or four days; in more than one-half of the cases there will be no leakage of urine. The stitches are removed on the eighth day, as a rule, and the patient allowed to leave the hospital in from 10 to 14 days.

This operation through the pelvis is known as pyelotomy and it is the operation of choice in moderate sized, single stones in the pelvis in non-suppurative cases.

For a long time it was taught that urinary fistulæ were much more apt to result in cases in which the stone was removed through an incision in the pelvis, than where it was removed through an incision in the kidney substance. My work of the last five years has distinctly disproved this view and my results have been confirmed by a number of other operators.

To-day, I think we can confidently select pyelotomy in preference to nephrotomy as being the safer, less bloody, and more satisfactory procedure.

Where, on the other hand, we have a large branched stone, coral-shaped stones, multiple stones, and stones accompanied by distinct and gross evidence of infection, then nephrotomy should be preferred to pyelotomy.

In nephrolithotomy the kidney should be well freed and brought out of the wound; a well-instructed assistant should compress the renal vessels with his fingers, so as control hæmorrhage. Especially constructed clamps may be employed for this purpose. I have always preferred an assistant.

An incision like the post-mortem cut is made about a centimeter posterior to the convex border of the kidney and directed toward the pelvis. This may be from two to five inches or more in length. If the assistant making pressure on the renal vessels does his part thoroughly, little blood will be lost.

The stone, or stones, are now removed with great care not to break them or leave any stone or stone fragment behind. The incision in the kidney is then, when there is no gross evidence of pus, completely closed by catgut sutures deeply placed and carefully tied so as not to cut through the tissue, which is quite friable. These sutures control the hæmorrhage surprisingly well and it is seldom necessary to ligate a vessel separately. The kid-

ney is now dropped back into its normal postion, a cigarette drain introduced and the wound closed as before.

Where there is gross evidence of pus in the kidney, it is important to determine before operation the presence and condition of the other kidney and the kidney sufficiency of the individual, so that, if at operation the conditions found argue in favor of nephrectomy, this may be undertaken with a full knowledge of the existing facts.

In case a stone is removed from a kidney with gross evidence of pus and impaired kidney tissue, if the impairment is not great, the kidney can be drained after the removal of the stones in the hope that a cure may result with the saving of a kidney of more or less value. On the other hand, where the kidney shows great changes, and it is evident that the kidney is of little value to the individual, and if left may be a menace, and if kidney sufficiency exists as shown by examination before operation, then a nephrectomy should be done.

In the last few years, I have been removing more of these old stone kidneys at the primary operation, avoiding often a later difficult and dangerous secondary nephrectomy. It has been especially in this matter that my own work has, in the last few years, shown improvement. In the surgery of kidney-stone it is not sufficient merely to remove the stone. We must cure our patient and, where possible, it is far better to do this with a single operation. I have found nephrectomy secondary to nephrolithotomy and nephrotomy for drainage often most difficult and hazardous; the kidney remnant being often bound down in dense connective tissue, making removal, except by morcellement and within the capsule, impossible; and even then I have injured the colon and duodenum and had serious and fatal hæmorrhage in these cases.

When the stone is in the ureter, the operation is on the whole more difficult than when in the kidney. If in the upper end of the ureter, the operation is much the same as a pyelotomy. If well down, the oblique kidney incision must be extended along the crest to well toward the internal ring, keeping outside the peritoneum.

All the ureter, except the last few inches, can be reached by this incision, the stone may be removed and ureter sutured and field drained as in pyelotomy. When the stone is projecting toward the bladder, it may be removed through a transvesical route. Where a stone cannot be reached either from above or through the bladder, it may be reached through the vagina, or by a parasacral route, much the same as a Kraske incision.

Dr. McArthur and myself were the first in this country to use successfully the X-ray in the diagnosis for stone and we were fortunate to precede the continental surgeons by some months; we were preceded, however, by several English operators. Since the introduction of the X-ray, I have located and removed by operation stones in about fifty cases.

I shall not give a detailed report of the entire series. I shall simply take a number to illustrate the most important points. As an example of the simple type of a single stone in a non-suppurating kidney, which fortunately represents more than one-half the series:

A. A physician, a class-mate of mine, had a number of attacks of renal colic, these became more frequent and threatened to invalid him. He came to my service, and my associate, Dr. J. F. Smith, secured several very good X-rays showing a stone about the size of the end of my thumb in the right pelvis. There was but a microscopic amount of pus and blood. No attempt was made to catheterize the ureters. A pyelotomy was made, a few drops of urine escaped along the drainage for a few days; stitches removed and the patient left the hospital on the 10th day.

As illustrating some of the complicated cases I shall cite, 1st.:

B. Cure persistent fistulæ.

Before the days of the X-ray, Dr. Nicholas Senn drained a kidney with the probable diagnosis of tuberculosis. The fistula persisted. After the X-ray was introduced, I obtained several good skiagraphs, showing a stone the size of an almond. I removed the stone from a kidney, the seat of a mild suppurative process. The fistula persisted for years, at first about twenty ounces of urine escaped each day. This gradually decreased until recently I found that it amounted to about an ounce and a half of fluid, and that it contained less than about one-tenth the solids of the bladder urine. The fistula was a source of discomfort and a menace, as at times the tube would come out during sleep and the fistula close, so that the tube could not be reintroduced, then retention of pus, with marked constitutional disturbances would occur, chills, fever, etc., and within a few days a discharge of pus from the fistula. On that account I recommended a secondary nephrectomy. This was done recently with great difficulty and the remnant of a kidney (Fig. 11) removed.

Fig. 11. Chronic suppurative pyelitis with destruction of the kidney and replacement by adipose and scar tissue. Intermittent obstruction of ureter. *A*, remnant of kidney tissue.

C. Stone and tuberculosis.

A girl of 18, sent to me with diagnosis of several appendix attacks. I removed the appendix, later she had severe attack which was found to be due to kidney-stone. This was removed. Later attack on same side; examination of specimen obtained by ureteral catheter showed tubercle bacilli. Nephrectomy, a a tuberculous kidney. Patient remained well for several years, was then brought to the hospital with complete anuria, which had existed for several days. Nephrotomy under gas with drainage, followed by a large amount of urine from wound. An X-ray showed a small stone in lower end of ureter. This passed on the tenth day into bladder; the kidney tube removed. Kidney wound closed rapidly, urinated within two weeks, and passed stone, per urethram; has been entirely well since this attack, now several years ago.

D. Bilateral stone, with complications:

A medical student; stone diagnosed and removed on one side. Later, pain on other side, stones shown by X-ray and removed. This left urinary fistula for some months. This curretted and healed later. Side upon which first operation was done gave symptoms. X-ray showed four stones. When patient was brought to the hospital, he was in such bad condition I was afraid to use ether or chloroform. It was at a time when we had not learned of the possibilities of nitrous oxide. So, under cocaine anæsthesia I removed these four stones. Since that time patient has been entirely well. He is now an active successful practitioner.

E. Bilateral stones of enormous size:

A young man, brought to my service with distinct history of kidney-stone on the right side. X-ray showed a large shadow as large as a kidney and several small shadows. Operation showed the large shadow was an enormous stone in the pelvis, and the other shadows stones in calices (Fig. 12). In removing these stones, I tore away part of the pelvic mucosa. The patient recovered after prolonged drainage. Years later, the patient returned with the same symptoms on the other side. Here a large kidney tumor could be felt and, on palpation, crepitus due to large stones rubbing together could be distinctly felt.

I operated under gas, and removed an enormous collection of stones (Fig. 13). The kidney was so riddled that I was tempted to do a nephrectomy, but refrained, because I did not know the condition of the other kidney. He died of hæmorrhage and shock. Post-mortem showed that the first kidney operated on had been reduced to a small hydronephrotic sac without any kidney substance.

F. Where X-ray failed to show stone distinctly and X-ray burn.

A man of 60 had symptoms of kidney-stone on the left side. This was in the early days of the X-ray when our technique was crude. An X-ray failed to find stone. I operated and removed a small, flat stone, about as large in diameter as a silver dime, from the pelvis. The man had had three X-ray exposures at intervals of two or three days, none longer than ten minutes. Ten days after operation patient had what I supposed, in my ignorance, to be erysipelas develop on the abdomen. An area a foot in diameter with center at the umbilicus. This proved to be an X-ray burn which was slow in healing. It took four months to heal completely. This was the only burn we have had in our series of now several hundred exposures for kidney lesions. Another interesting fact in connection with this case, is that after operation on careful examination of the X-ray plate we could clearly see the stone covered by the twelfth rib.

G. Stone with anuria.

Young man of 20 was brought to the hospital with complete anuria for a week. Examination showed enormous hydronephrotic sac on the left side; this was opened and drained; no relief. The next day the left kidney was drained. This was found to be enlarged by compensatory hypertrophy to about twice the size of a normal kidney. A large amount of urine

Fig. 12. Kidney-stone removed by nephrolithotomy, with attempt made to save the kidney. Natural size.

Fig. 13. Kidney stone removed by nephrolithotomy, with attempt to save the kidney. Natural size.

escaped for weeks from incision; small stone in ureter finally expelled, and after the removal of hydronephrotic sac, complete recovery.

H. Secondary hæmorrhage after nephrolithotomy.

Civil engineer of 40, with stones in both kidneys. One side had been operated on. At second operation on other kidney, stones removed by nephrolithotomy.

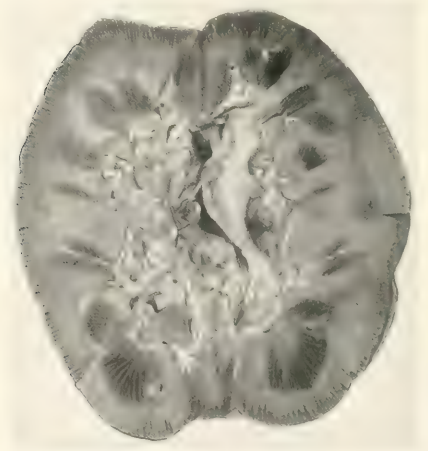


Fig. 14. Compensatory hypertrophy of the single functionating kidney.

Fig. 15. Remnant of a kidney from which several stones had been removed, leaving a suppurating urinary fistula, necessitating nephrectomy. Natural size.

On eighth day severe secondary hæmorrhage and final recovery. Patient died later in third operation in the hands of another surgeon, during an attempt to remove remnant of kidney first operated upon.

I. Stone ulcerating into duodenum.

Young man of 25 had abscess in loin opened as lumbar or psoas abscess. Pus and urine escaped

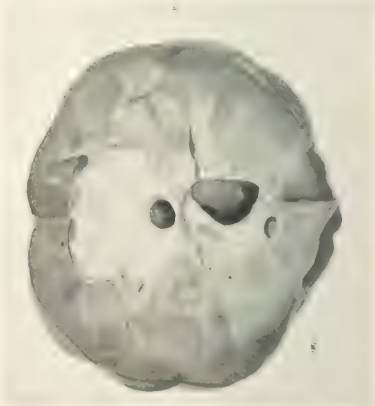


Fig. 16. Two stones in the pelvis of the kidney. Stones at *A* and *B*. Post-mortem specimen.

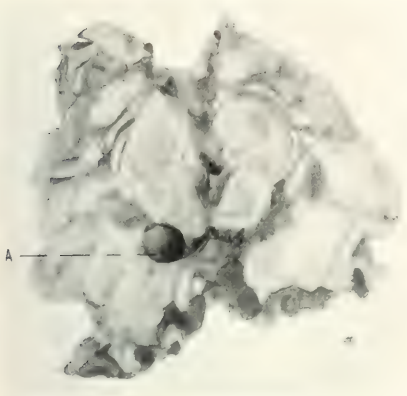


Fig. 17. Total destruction of the diseased kidney as a functionating organ. Kidney reduced to a mass of inflamed fatty tissue containing a stone at *A*.

from fistula. X-ray showed stones. The fistula was surrounded by a mushroom-like mass of granulations with multiple openings, discharging fetid pus and urine. Operation: Nephrectomy of infected kidney remnant containing stones. This was imbedded in a mass of dense connective tissue, as though the kidney had been surrounded by a mass of plaster of Paris. Kidney remnant removed from within dense fibrous capsule. A horn-shaped stone had ulcerated its way into duodenum. Death from pulmonary hæmorrhage on seventh day, due to infected infarcts of both lower lobes.

CONCLUSIONS

The work of the last ten years has placed the diagnosis and treatment of kidney-stone on an established basis. The diagnosis is determined by a process of exclusion and confirmed by the X-ray. When the diagnosis is definite, the treatment should be surgical removal, except in cases of small stones, which may be passed, or in cases of extreme age, or in the presence of organic lesions which strongly contraindicate operation. In a single stone in the pelvis of a comparatively sound kidney, the operation of pyelotomy with closure is the operation of choice. In cases with large stone and, especially multiple stones, in both pelvis and calices, and in cases with considerable infection, nephrolithotomy, with or without drainage, should be resorted to.

In cases in which stones are found in a kidney which is so altered as to be of little value to the patient and where kidney sufficiency has been demonstrated and the other kidney is not involved, primary nephrectomy should be done. In primary stones involving but one kidney, pyelotomy and nephrolithotomy are comparatively safe procedures, carrying with them but from 3 to 4 per cent of risk. Where both kidneys contain calculi, the dangers of the pathological condition and the operation for its relief naturally increases. And where, because of infection and destructive processes, nephrectomy is required, the dangers of the operation will depend upon the integrity of the other kidney and its functional capacity and the dangers resultant upon the surgical removal of the diseased organ.

In my own series of 52 operations done for kidney-stone, I have had but one death from nephrolithotomy and two deaths from secondary nephrectomies; both made extremely difficult because of the necessity of digging the kidney remnant out of dense scar tissue due to long-standing perinephritic inflammation. On the whole, we can to-day regard the diagnosis and treatment of kidney-stone as one of the great triumphs of modern surgery, both from the standpoint of relieving suffering and saving life.

STONE, TUBERCULOSIS OF THE KIDNEY, AND PERINEPHRIC ABSCESS[1]

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STONE may exist in the kidney or ureter without infection, although it is probable that infection occurs sooner or later in the large majority of cases; and infection, tuberculous or septic, may and probably in the majority of cases, does occur without the presence of stone. Either of these factors may act as the causative agent of the other — pus, or blood clot, or bacteria may form the nucleus or furnish the colloid material for building up a stone; a stone, by wounding or irritating the tissues about it, may furnish the atrium of entrance or produce the locus minoris resistentiæ for pathogenic organisms.

Thus, we often get stone and suppuration together. Beyond what has been stated and the belief that the urinary salts are deposited in excess because there is a lack of balance between ingestion and assimilation, ingestion of too much nitrogenous food with too little exercise and imperfect oxidation of the nitrogenous products, little definite is known as to the etiology of calculus. Heredity seems to be important. It is claimed that sudden chilling of the body may cause precipitation of the solid material from a saturated urine in the renal tubuli, forming a calculus in the parenchyma; or, being washed farther on, it forms the nucleus of a stone in the pelvis of the kidney. According to the size of the particles, the precipitate is known as sand, gravel, or stone. The composition is uric acid, urates, calcium oxalate, calicum carbonate, ammoniomagnesium phosphate, and rarely cystin or xanthin.

Primary calculi are usually composed of uric acid and oxalate of calcium, one or both, and are found in acid urine; secondary calculi are composed of phosphate and carbonate of calcium and phosphate of magnesium, usually deposited on a nucleus composed of a primary stone or of mucus, pus, blood clot, hair, or other foreign matter, in alkaline urine.

Symptoms. The symptoms of stone in the kidney are caused by infection, or the mechanical action of the stone; hence, if there is no infection, and if the stone is situated so as not to produce obstructon or laceration, there will be no symptoms. The most reliable symptoms are pain, renal colic, the presence of blood, pus, or gravel in the urine, and oliguria, or symptoms of suppression of urine. The pain is usually felt in the lumbar region of the affected side and may be aggravated by motion. It may extend along the ureter to the bladder, testicle, penis, thigh, foot, and may be referred to the sound kidney. Palpation or percussion over the kidney may cause pain. Often the first sign of calculus is an attack of renal colic caused by the stone blocking or traveling along the ureter, characterized by excruciating pain along the ureter, and often into the testicle and inner side of the thigh, frequent micturition with a little blood in the urine, vomiting, and sometimes chill and fever.

If the symptoms end suddenly, the stone has either dropped back into the kidney pelvis, or has completed its journey to the bladder; and careful examination of the urine should be made for two or three weeks, or the bladder may be cystoscoped for the stone.

If, instead of suddenly ceasing, the symptoms of renal colic merely subside to a subacute condition, it means impaction of the calculus in the ureter; and, if it continues beyond 24 hours there are likely to be fever, and pus may be formed in the urine. The point of impaction in the ureter may often be determined by the location of the greatest pain and tenderness. Statistics would indicate that the most frequent site of lodgment is the juxtavesical portion; next, the juxtapelvic; and last, the portion at the brim of the bony pelvis. Sometimes the ureter is so completely blocked by the calculus, that nothing passes through it to the bladder; then it is that cystoscopy and ureteral catheterization are of the greatest

[illegible]

value; also the use of the Roentgen-ray, especially when the symptoms have been referred to both kidneys.

The retention of the stone in the kidney leads to infection and to various destructive changes in the organ — most frequently, perhaps, to pyelitis or pyonephrosis — sometimes to hydronephrosis and to pyelonephritis. The symptoms of renal calculus in the absence of renal colic are pain in the lumbar region which varies in character and severity, often a dull, heavy ache which may be aggravated by stooping, bending, or jarring. There are frequent micturition, pyuria, tenderness on palpating the affected kidney, and sometimes an appreciable enlargement of the kidney. Casper and others use phloridzin and cryoscopy in order to test the functional activity of the kidneys and to compare one kidney with the other. Phloridzin injected under the skin, gram .01, produces diabetes which lasts about three hours. If one kidney is crippled by reason of a stone, tuberculosis, or other cause, the urine from that kidney shows a smaller amount of sugar than the urine from the healthy kidney. Also, on freezing the urine collected from the two kidneys separately, it is found that the urine from the crippled kidney contains less solid matter in solution and therefore freezes at a higher temperature (less degree of cold) than that from the healthy kidney.

If the disease last long, constitutional symptoms, fever, chills, and loss of flesh, come on.

TUBERCULOSIS OF THE KIDNEY

The consensus of opinion to-day is that tuberculosis of the kidney is, as a rule, of hæmatogenous origin and often unilateral, being primary in the kidney in about 15 per cent of cases (Watson, Tuffier, quoted by Walker), and secondary, in the majority of cases, to tuberculous foci in other parts of the body, as the bronchial and lumbar glands (Walker). Very rarely it is secondary to tuberculosis of the bladder. Sometimes the organ is invaded from an adjacent tuberculous vertebra.

It seems that injury of the kidney, as by blows or the presence of stone, and the various inflammations, including gonorrhœal, predispose to the occurrence of tuberculosis; the age during which most patients are affected is from 20 to 45, but the limits are from 3 months to 70 years; as to sex, women slightly predominate; and the right kidney suffers more frequently than the left. The ureter is said to be affected in 10 or 12 per cent of cases. The sound kidney is usually enlarged by hypertrophy. The tissues surrounding the kidney are not infrequently involved and perinephric abscess may result,

Symptoms. These may be frank or insidious, and may be divided into urinary, vesical, renal, and general.

Urinary symptoms. The first symptom is usually polyuria, which may last a month or so, with no change in the composition of the urine, except that it is low in specific gravity. Blood and pus soon appear — the former usually intermittent and in small quantity, requiring a microscope for its detection; at other times the quantity may be considerable.

Pus may be small in quantity but is usually found early and in abundance, often forming a large precipitate up to one-half the urine by volume. Crumbling caseous particles occur in the urine and in them tubercle bacilli are often found. Tubercle bacilli are found in the urine in 70 to 80 per cent of cases, if careful examination is made (Casper). The phloridzin and cryoscopy tests are valuable.

Vesical symptoms. Frequent and painful micturition is nearly always present, the frequency varying from every two or three hours to every ten or fifteen minutes, night and day, and the pain from a slight, uneasy sensation to one of severe burning and tenesmus. These symptoms are not due to tuberculous ulcers in the bladder, but simply to irritation from the tuberculous urine. The cystoscope shows injection of the bladder mucous membrane, and especially a red inflamed elevation around the mouth of the ureter on the affected side — occasionally tuberculous ulcers near the ureteral mouth.

Renal symptoms. Rarely no pain is felt in the region of the kidney. Usually there is pain of a dull, aching or sharp lancinating, character, intermittent or almost continuous, sometimes radiating to the groin, testicle, penis, or umbilicus, or even to the shoulder. In perhaps 30 per cent of cases, a mass can be felt and in the majority there is tenderness on deep

pressure — occasionally the thickened ureter can be recognized by palpation.

General symptoms. There are chills, fever, sweats, loss of flesh, vomiting, and uræmia. The fever is seldom noticed as an early symptom, later it is well marked, may be irregular, intermittent, moderate, high, and associated with chills or chilly sensations, and profuse sweats. The pulse corresponds. Anorexia, indigestion, anæmia, and loss of flesh soon follow and a cachexia is established. Uræmia usually means that both kidneys have been invaded.

The course of the disease varies, death may result within a few months or a year after its inception, or it may be much longer delayed, and the patient may have fairly good health for several years.

PERINEPHRIC ABSCESS

Perinephric abscess is the result of infection of the tissues immediately surrounding the kidney. Casper makes three divisions, namely, peri-, epi-, and para-nephritis — the first meaning inflammation of the fibrous capsule, the second that of the fatty capsule, and the third that of the retroperitoneal mass of fat behind the kidney. Usually it is not possible to differentiate between them, and the term perinephric abscess is used here to mean a collection of pus in the fat surrounding or adjacent to the kidney — so often of doubtful origin and difficult of explanation.

The abscess may be *primary*, as the result of traumatism or of hæmatogenous infection; but far more frequently, it is *secondary* to some infection of the kidney or other organ, such as the appendix, gall-bladder, spleen, lung, pleura, bones, prostate, bladder, or rectum. As it is sometimes impossible to discover any other primary focus, it is thought that infection may take place through the unbroken walls of the colon. The affection is more frequent in men and on the right side, but is occasionally bilateral. The abscess may be single or multiple, and the pus may be odorless, or it may have a fæcal or urinous odor. The abscess may be partly within and partly without the kidney, and is usually behind that organ, but may be above, below, or in front of it. The pus may burrow in any direction — behind the peritoneum and break into the rectum, bladder, vagina, urethra, kidney, or ureter; it may follow the iliac vessels to Poupart's ligament, or pass through the sacrosciatic foramen and point in the gluteal region; it may break into the stomach, liver, intestine, pericardium, or peritoneal cavity; but the most common places for pointing are in the lumbar region (Pettit's triangle), and the pleural cavity (White and Martin).

DIFFERENTIAL DIAGNOSIS BETWEEN STONE IN THE KIDNEY, TUBERCULOSIS OF THE KIDNEY AND PERINEPHRIC ABSCESS

	Stone in the Kidney.	Tuberculosis of the Kidney.	Perinephric Abscess.
Pain.	Dull aching, burning, sharp, lancinating, intermittent. Renal colic common.	Dull aching, more apt to be continuous. Renal colic rare.	Dull, aching, continuous. Renal colic rare.
Tenderness.	Usually present.	Well marked.	Well marked.
Mass or Tumor.	Seldom felt.	Often felt, defined and movable with respiration.	Usually felt, irregular, not moving with respiration.
Hæmaturia.	Occurs early, intermittent, small quantity.	Occurs early, small quantity — may be large.	Not present.
Polyuria.	No.	In earliest stage.	No.
Pyuria.	Intermittent, may not be present.	Nearly always present in abundance.	Sometimes present.
Micturition.	Frequent.	Frequent.	Often not affected.
Cystoscopy and ureteral catheterization.	Perhaps passes blood from ureter.	Pus from one or both ureters, ulceration of the bladder or cystitis.	May be negative unless secondary to kidney disease. If abscess communicates with ureter. May follow either of the other diseases.

The Roentgen ray may show a stone in the kidney; its negative evidence is not always reliable. The tuberculin test may establish the presence of tuberculosis.

Symptoms. Pain, tenderness, chill, fever, and a palpable mass are the chief symptoms. Pain is felt in the loin and is aggravated by pressure or motion, so that the muscles are contracted in such a way as to diminish pressure and prevent motion; thus the patient lies on his back with the thigh flexed and adducted, and the spine flexed with the cavity towards the affected side. Pain may be felt along the ureter, in the genitalia, the inner side of the thigh or the foot, and the latter may show œdema or swelling. The area of dullness in

the loin is increased and a tender, irregular, diffused mass, fixed and motionless on respiration, is felt. Œdema and fluctuation may be present. The urine may contain pus when the kidney is sound, if the abscess communicates with the ureter. (See case 2.)

Other symptoms may be sweating, vomiting, anoræxia, and leucocytosis.

Treatment. A stone in the kidney should be removed as soon as possible, whether or not it is causing trouble, as trouble would inevitably occur in time and the safest time for removal is before infection or inflammation sets in. A stone impacted in the ureter should be removed, after a reasonable delay to see if it is able to reach the bladder. Reasonable delay cannot be exactly given in time, as it depends on the symptoms and circumstances. As a rule, 48 hours is long enough to wait, but sometimes it may be advisable to wait a week. The longer the delay, the greater the danger of damage to the kidney and ureter. To prevent the recurrence of stone in the kidney after operation, is a great desideratum.

The use of the drainage tube, until all infection has disappeared, is important. The diet and habits of the patient should be regulated in order to get the proper adjustment between ingestion and assimilation. Alkaline salts, lithium citrate and acetate, for uric acid stone, and oxalic acid for phosphate stones, are used.

The question often comes up as to the propriety of removing a kindey which has continued to reproduce calculi. This should not be done as long as there is any hope of saving the kidney. In cases where the kidney has been destroyed and only a pus sac remains, and in pyelonephritis with multiple abscesses and continued suppuration in spite of treatment, nephrectomy is advisable.

Tuberculosis of the kidney, if recognized when it is limited to one kidney, should be treated by nephrectomy. If the ureter is affected, it should be removed with the kidney. The best incision for nephrectomy is the Morris incision, passing obliquely downward and forward between the last rib and crest of the ilium. It may be continued on to a point just above the external abdominal, ring when it is necessary to expose the ureter as far as, and part way into, the pelvis. For calculi impacted in the vesical portion of the ureter, the mouth of the ureter may be dilated or cut from within the bladder, through speculum, or cystoscope, or suprapubic section. Stone in the juxtavesical portion of the ureter in the female may be removed through the vagina, or in the male by an incision through the posterior part of the ischiorectal fossa (Rigby, Annals of Surgery, November, 1907).

If both kidneys are tuberculous and suppurating, nephrostomy and free drainage should be provided. Proper hygienic and climatic treatment, are of course, essential.

Perinephric abscess should be treated by incision and drainage as soon as possible, and the origin should be ascertained and treated appropriately.

Below are reported a few selected cases, illustrative of the conditions discussed.

1 *Patent Urachus : Stones in Both Kidneys : Four Operations within Two Years and a Half.*

This was a healthy looking man, 40 years old, who was operated on, June 25, 1904, for patent urachus, the urachus being dissected out down to the bladder. About six years previous to this operation, the patient began to have attacks suggesting stone in the right kidney; and, a little later, pain began to occur in the left kidney. He had several attacks of severe pain in the region of the kidneys — sometimes renal colic. Two months after recovery from the operation on the urachus, he was taken with severe pain in the right loin, extending along the course of the ureter, bloody purulent urine, chill, vomiting, delirium, pulse 120 to 140, temperature 104, face and feet slightly swollen.

The right kidney was exposed and opened from its convex border to the pelvis, evacuating urine and pus and removing a round, smooth, dark-brown calculus about 13 m.m. in diameter. (See fig. 1.) The kidney pelvis was considerably dilated, evidently from obstruction by the stone, but no abscesses in the parenchyma were found. A rubber tube for drainage was fastened in the kidney. Recovery in one month, and no further trouble until February, 1905, when he had an attack of renal colic on the left side and passed several small calculi. A month later he had a similar attack with chill, fever (106), oliguria, and delirium, from which he soon recovered. Examination in April, about a month after this attack, showed hardness and tenderness in the region of the left kidney; and operation was recommended and performed, May 1, 1905, using the oblique incision and removing the 12th rib, as it was in the way. (See fig. 4.) Before opening the kidney, two stones could be felt in the lower part of the organ. Incision through the convex border to the pelvis was made and the two stones removed from two separate calices or infundibula. (See figure 2.) Other small fragments were felt and one was removed; and the parts irrigated with salt solution

STONES FROM KIDNEYS OF A. WILLIAMS

13.5 mm.

Fig. 1.

Stone removed from right kidney, August 21, 1904.

15 mm. 12 mm.

Fig. 2.

Stones from left kidney, May 1, 1905.

25 mm. 20 mm. 12 mm. 8.5 mm. 9 mm. 5.33 mm. 3.5 mm.

Fig. 3.

Stones from left kidney, December 6, 1906.

Fig. 4.

Bone in box.

in the hope of washing the fragments out. There was no obstruction at that time, the kidney was about normal in size, but much congested and no pus or urine was found. The wound in the kidney was closed with catgut around a rubber drainage tube. The tube was worn about 4 weeks and recovery seemed complete in 6 weeks, the patient regaining his appetite, weight, and general feeling of comfort. There was no further trouble for a year, when in June, 1906, he was taken with pain in the left hip and loin, chills, fever — these symptoms lasting some time — no typical attack of renal colic. Four months later, the symptoms returned with considerable pyuria and, December 6, 1906, the left kidney was again operated on. The abscess in the kidney had just reached the surface by a small opening in the lumbar region. The kidney was exposed at a depth of 3 inches from the skin, opened and fully 500 c.c. of thick, creamy pus evacuated. The pelvis and calices were much dilated and a large coral calculus was removed in fragments. (See figure 4.) Strong adhesions existed everywhere. The cavity was irrigated with salt solution and two rubber tubes were sewed in place. The patient recovered with his usual promptness, and by the end of January, 1907, had gained 20 pounds in weight and seemed in perfect health. There has been no further trouble up to this time, 16 months after the last operation.

Remarks. The number of operations in a short space of time is unusual, and the promptness and facility with which the patient recovered from every operation remarkable. The history may be summed up thus:

First operation, June, 1904 — excision of patent urachus.

Second operation, August, 1904 — stone removed from right kidney.

Third operation, May, 1905 — 2 stones removed from left kidney.

Fourth operation, December, 1906 — coral stone removed from left kidney.

It is probable that the urachus became infected through the bladder from the kidneys, and it was this leakage of foul-smelling urine and pus from his navel that induced the patient to have the urachus excised. The right kidney seems to have been first affected with stone. At the operation only one stone was found, it was removed and this kidney has given rise to no further symptoms for nearly 4 years. On the other hand, the left kidney when first operated on contained some fragments and it is not certain that all were removed. This may account for the recurrence of stone and pus, requiring a second operation on the left kidney in about 18 months after the first.

Fig. 5. Stone from right ureter bladder end of Mrs. Shultz, November 4, 1907. Weight, 915 grains; length, $2\frac{3}{4}$ inches; circumference, $4\frac{1}{2}$ inches.

2. Enormous Stone in the Juxtavesical Portion of the Right Ureter — a Small Stone in the Vesical Portion — a Large Perinephric Abscess Draining into the Ureter.

A woman, 33 years old, was referred to me by Dr. S. L. Owens, and was admitted to Georgetown University Hospital with the following history: Three years before she had been operated on for stone in the right ureter by a median abdominal incision and made a good recovery. Had articular rheumatism, January, 1907, affecting knees, ankles, and tarsal joints, and lasting about a month. Her present trouble began about a month ago with an attack of renal colic on the right side. At first, the pain was sharp and intermittent. After a few days, it became continuous, less severe, but with exacerbations, requiring morphine frequently. These symptoms, with frequent urination, chills, fever, and blood and pus in the urine, have continued to the present time.

Examination shows rigidity of muscles and tenderness over the right side of the abdomen. By vagina a hard mass, about as large as a hen's egg, could be felt anterior and to the right of the cervix uteri, and was thought to be a stone in the ureter or just outside of the ureter. An incision was made in the vagina and a large stone removed from the ureter. (See figure 5.)

The removal of the stone was followed by the discharge of a quantity of foul-smelling pus and urine. The ureter was much dilated and admitted the passage of a large bougie, No. 20, as far as the brim of the pelvis. There was free discharge of urine and pus, and the patient did well for a week, when pain in the region of the right kidney became troublesome — a continual, dull, aching pain, and the temperature and pulse rose again. The urine from the bladder was clear — that from the ureterovaginal fistula contained pus in abundance. Pyelitis or pyelonephritis was thought to exist, with obstruction of the lower end of the ureter, and it was decided to open the kidney and explore the ureter. A sound, passed into the bladder, readily detected a stone in the mouth of the right ureter. This was removed by passing the little finger of one hand into the bladder, through the urethra, and two fingers of the other hand into the vagina. By this means the little stone was worked into the bladder and then out through the urethra. The stone is represented

Fig. 6.—Tuberculous kidney.

Fig. 7.—Tuberculous kidney and ureter.

in figure 5 as the sharp-pointed fragment attached to one end of the large stone. An oblique incision was then made to expose the kidney, when a large abscess, capacity about 750 c.c., was opened. The abscess was situated above and behind the kidney, and the latter had been displaced downward until its upper pole corresponded with the middle of the space between the last rib and the crest of the ilium. No communication could be found with the kidney, and the kidney looked and felt normal, but it was opened by an incision through its convex border into the pelvis and the finger was inserted into the pelvis. Nothing abnormal was found. The wound in the kidney was closed without drainage and the muscles and skin were closed, leaving room for drainage of the abscess by tube and gauze. Recovery was rapid and in four weeks the patient was discharged well, except for a slight leak from the ureterovaginal fistula which soon closed spontaneously.

Remarks. The interesting features about this case were: 1. The enormous size of the calculus, weighing 61 grams (915 grains), measuring 7 c.m. ($2\frac{3}{4}$ in.) in length and 11.5 c.m. ($4\frac{1}{2}$ in.) in circumference. It was whitish in color and irregularly spindle-shaped; 2. The occurrence of a large perinephric abscess, communicating at some point with the ureter, but apparently having no communication with the kidney. The abscess probably originated from the kidney while occupied by the stone without leaving any macroscopic evidence of the fact, and as it grew in size finally ruptured into the ureter behind the calculus.

3. *Pyelonephritis of the Left Kidney with Calculi and Pyelitis of the Right Kidney — Probably of Gonorrhœal Origin — Removal of the Left Kidney and Ureter — Later Operation on and Drainage of the Right Kidney.*

A man, aged 26 years, gave a history of gonorrhœal urethritis 4 years before and had continued to discharge pus from the urethra ever since. Pain in the region of the left kidney had been almost continuous, with occasional pain in the right side. He had been treated by internal medication and vesical irrigation, but the pus continued to flow and his health to decline. Chills and fever have been frequent and micturition averages once an hour, day and night. Patient had lost about one-third of his normal weight and was thin and sallow. Pulse 80 to 94, temperature 98.4 to 99.4. Thickening and tenderness were detected in the left loin. No gonococci or tubercle bacilli were found in the urine.

The left kidney was exposed by an oblique incision, and was found converted into a multilocular pus sac, the parenchyma having been destroyed, containing some pus and about a teaspoonful of gravel and small calculi. The ureter was thickened and dilated its entire length, its lumen admitting the index finger.

The kidney was removed and the ureter to within 2 or 3 inches of the bladder, making a second incision in front from near the crest of the ilium, inward and downward to a point just above the internal abdominal ring. The stump of the ureter was stitched to the skin in the inguinal region. Much improvement followed this operation, but urine continued to flow through the stump of the ureter, when in March, 1906, about 18 months later, it was decided to open and drain the right kidney. This was done and a suppurative pyelitis was found. The kidney was opened from convex border to pelvis, and then sewed up around a rubber drainage tube, which was left in place one month and a half, when the urine was nearly all passing to the bladder. The fistula left by the tube soon healed and that from the ureteral stump healed a few months later, the patient gained his normal weight and returned to his work six years from the beginning of his disease, and after two years continuous stay in hospital. When seen recently, the patient was in fair health, up to his normal weight, attending to his business but was still passing some pus with his urine and the ureteral fistula had opened again.

4. *Tuberculosis of the Right Kidney and Ureter — Nephro-Ureterectomy — Death.*

A woman, 28 years old, the mother of one child, was taken sick in February, 1904, with cold, cough, frequent urination, cessation of menstruation, and pain in the right loin. In April, pus was found in the urine and she went to bed with fever, 98 to 104, nausea, occasional vomiting, and rapid loss of flesh. Examination 3 months after the disease began, showed a very sick woman, suffering much pain in the right loin, frequent urination, and pulse 120, temperature 97.2 to 102. A nodulated tender mass could be easily felt below the ribs on the right side and extending into the iliac fossa. Tubercle bacilli found in the urine. The kidney and the ureter to a little below the brim of the pelvis were removed through the oblique incision. Death, three days later during a convulsion. It was impossible to ascertain the quantity of urine passed, as it was passed involuntarily. The kidney was studded throughout with small tuberculous nodules and abscesses. The ureter also was very much thickened and diseased. (See figures 6 and 7.)

Remarks.. No doubt, both kidneys were diseased and after the operation the remaining one was unable to keep up the work of elimination to a viable degree. The patient was doomed and had no chance of cure under any method of treatment.

5. *Perinephric Abscess Communicating with the Kidney, Result of Catheterization in a Patient with Fractured Spine.*

A man, 32 years old, had a laminectomy performed, March, 1902, on account of fracture of the 11th and 12th dorsal vertebræ. After six months of catheterization, the patient had chill, fever, sweats, pain in the right loin, pus in the urine, and a tender mass could be felt in the region of the right kidney.

Operation showed a large perinephric abscess behind the kidney and communicating with its lower portion. The abscess was drained and the patient recovered in six weeks. Seven months, later death occurred from acute intestinal obstruction.

ACUTE UNILATERAL HÆMATOGENOUS INFECTIONS OF THE KIDNEY[1]

By GEORGE EMERSON BREWER, M. D.

IN connection with the other papers which have been presented this morning upon the surgical diseases of the kidney, I desire very briefly to call the attention of the Association to a type of acute renal disease, which is not, as a rule, recognized by the profession. I refer to the early stage of an acute hæmatogenous infection of one kidney. That I am justified in stating that the condition is not generally recognized, is evidenced by the fact that, of nine more or less typical examples of the disease which have been admitted to my service at the Roosevelt Hospital during the past four years, only one came in with a diagnosis of renal infection. Of the other eight, one was diagnosticated acute cholecystitis, one a perforating lesion of the colon, one general sepsis, the remaining five being sent in with the diagnosis of acute appendicitis.

The condition to which I refer was first brought to my attention by the following case, which occurred in my service at the New York City Hospital some twelve years ago. The patient was a female, aged twenty years, admitted to the hospital suffering from double femoral fracture and multiple contusions of

[1] Read before the American Surgical Association, Richmond, May 1, 1907.

the body. After some three weeks of treatment, during which there were no evidences of disease or infection of any kind, she suddenly became violently ill, with symptoms suggesting an attack of grippe. The temperature rose to 104° F. or more; the pulse was accelerated; she complained of pain in the back and extremities. After two or three days of observation, a careful examination revealed tenderness over the right kidney, albumen and pus in the urine. Exploratory nephrectomy was advised, and refused by the patient. The symptoms increased in severity; she complained of constant aching pain in the right flank, had a number of chills, became delirious, and presented every evidence of a profound and rapidly progressive sepsis. At no time did she complain of pain or tenderness over the left kidney. Consent was finally obtained for operation. Under a general anæsthesia, the right kidney was exposed by a lumbar incision. The perirenal fat was found to be œdematous, the surface of the kidney was studded with deep, red, elevated lesions. On incising the cortex, the entire parenchyma was found to be filled with minute abscesses, the largest being about 0.5 cm. in diameter. There was considerable hæmorrhage from the cut surface of the kidney, which was controlled with difficulty. As the patient's condition was critical, the kidney incision was packed with gauze, and the external wound partly united and dressed. She died within twelve hours.

During the next five years two other cases were encountered, each almost identical in onset, clinical history, and pathological findings. In both of these cases the kidney was explored, incised, and drained. Both died within twenty-four hours.

Up to this time I feared to perform a nephrectomy, for the reason that I believed the lesion to be bilateral, although the symptoms pointed to one side only.

The next case, was, as will be seen, more carefully studied, and, the treatment being the same, the autopsy gave me my first definite conception of the true pathological lesion, and clearly pointed to more radical treatment.

The patient was a man, aged twenty-one years, who, at first, complained of general pain and fever. The symptoms temporarily subsided, but three weeks later pain occurred over the right kidney region, and was accompanied by a rapidly rising temperature and other symptoms of progressive sepsis. On examination, there was tenderness and some muscular rigidity in the right flank. The urine was albuminous, contained some pus, a few red cells, and casts. Urine from the right kidney was scanty, highly albuminous, contained many red cells, and a few white cells; that from the left practically normal. Temperature, 105.5° F.; leucocytes, 20,200. No evidence of other septic foci could be found. The right kidney was exposed by lumbar incision, and freely opened by a cortical cut. The entire parenchyma was studded with minute abscesses. Drainage was inserted, and the wound partly closed. There was marked improvement in the symptoms, which continued for several days, but this improvement was succeeded by a gradual return of the septic manifestations, with scanty albuminous urine, delirium, and death. On autopsy, the right kidney was found to be completely destroyed by numerous abscesses. The left kidney, spleen, and other organs showed the presence of very recent septic infarcts, which had not broken down. Cultures demonstrated streptococcus pyogenes. In this case the lesion was evidently unilateral at the time of the first operation; and, had the kidney been removed at that time, recovery would probably have occurred.

This case served to awaken my interest in the matter, and, taken in connection with my previous experience, conclusively demonstrated that in these cases we have to do with a severe type of infection, presenting an obscure symptomatology, which tends to progress rapidly to a fatal termination, unless something far more radical in the way of treatment be employed than that carried out in my earlier cases.

It is a well known and generally accepted fact, that during the progress of any acute infectious disease a certain number of microorganisms find their way into the blood current. It has also been shown, by numerous experiments, that many of these organisms are excreted through the kidneys. If the number of organisms is comparatively small, if their virulence is low, and if the kidneys are in a healthy condition, the transit of these organ-

isms through the renal apparatus gives rise to no demonstrable lesion. If, on the other hand, the number of the organisms is large, if their virulence is high, or if one or both kidneys are diseased, lesions are produced, which may vary from a slight, cloudy swelling or glomerular nephritis, to a complete destruction of the organ by purulent infiltration or necrosis.

The lesions most commonly found in these cases are due to a plugging of the smaller arteries and capillary vessels with groups of organisms. These minute emboli are later surrounded by an encircling zone of round cell infiltration. Where the larger trunks are thus involved, triangular infarcts are present; where the capillaries only are involved, minute abscesses are seen throughout the cortex and beneath the capsule. If the process is allowed to go on, the bacterial emboli are rarely recognized, only areas of necrosis and purulent infiltration are found. At a still later stage many of these collections of pus coalesce, forming larger parenchymatous abscesses, which may rupture through the capsule giving rise to a perinephritis, or into the pelvis giving the typical picture of pyelonephritis. In some of the cases, the condition has been described as an acute, purulent, interstitial nephritis. In the writer's opinion, all of these appearances are but different stages of the same process.

As Israel had already called attention to the fact that trauma, calculus disease, ureteral obstruction, and floating kidney, act as strong predisposing factors in directing a given blood infection to one kidney, a series of animal experiments were undertaken to verify these statements and to afford an opportunity of studying the lesions thus produced.

Broth cultures of various pathogenic organisms, as the colon bacillus, bacillus typhosus, streptococcus pyogenes, staphylococcus pyogenes aureus, pneumococcus, and others were injected into the ear veins of rabbits and dogs, and one kidney subjected to various forms and degrees of trauma. In other cases, conditions simulating calculus were produced by injecting bismuth paste into the pelvis and ureter; while in others, the ureter was ligated. In a large proportion of these experiments, lesions were produced in the injured kidney identical with these found in our clinical cases. A record of these experiments, together with a report of thirteen clinical cases, was publised in Surgery, Gynecology and Obstetrics in May, 1906, to which the reader is referred for further details.

Without dwelling further upon the pathology of these cases, the writer will proceed to describe the three clinical types of the infection.

First, the severe type, in which the toxæmia is so great as to obscure the comparatively mild renal symptoms. This type progresses rapidly to a fatal termination unless promptly arrested by nephrectomy. Thirteen cases of this type have come under the observation of the writer, of which five were treated by nephrotomy and drainage, death following in every instance; eight were treated by nephrectomy, all recovering. The following two cases will serve as examples.

A woman, aged 22 years, experienced a severe pain in the epigastrium and right side of abdomen, with vomiting and high fever. She was sent to the Roosevelt Hospital with a diagnosis of acute appendicitis. On examination, the appendix region was free from evidence of inflammation. There was, however, pain and muscular rigidity in the right hypochondriac region, with tender points over the gall-bladder and costovertebral angle. Temperature 105° F.; pulse 120; leucocytes, 18,000.

Cystoscopic examination was negative, urine from the right kidney scanty and slightly albuminous, few pus and blood cells; that from the left kidney was abundant and apparently normal. Widal negative; no plasmodia; no tubercle bacilli in the urine. The diagnosis rested between an acute infection of the gall-bladder or kidney. Small anterior incision; gall-bladder and liver found to be normal, but the right kidney seemed to be enlarged. Anterior incision united, and the kidney exposed by lumbar route. The perinephritic fatty tissue was œdematous; the kidney enlarged, highly congested, and the seat of innumerable small infarcts. Nephrectomy performed. After operation, the temperature fell from 105.5° F. to 97° F. within twelve hours, and thereafter remained practically normal.

She made a satisfactory convalescence. Microscopic examination of the specimen showed it to be filled with minute, embolic abscesses.

One year later this patient married and became pregnant. I had an opportunity of examining her urine before and after her confinement. It was normal in every respect. Her confinement was normal, and she presented the picture of robust health two months later.

A young, married woman was admitted to the Roosevelt Hospital, suffering from right-sided abdominal pain, high fever, and extreme nervous restlessness. Six weeks before, she had an attack of supposed peritonitis from unknown cause. After recovery from this, she remained well until forty-eight hours before admission to the hospital, when she began to complain of pain in the region of the gall-bladder, with vomiting and a rapidly rising temperature. On admission, the temperature was 105.8° F.; pulse 140; rapid respiration. Examination of the chest was negative. On attempting to palpate the abdomen, the patient complained of such extreme tenderness, and became so excited and hysterical, that nothing could be elicited. (These symptoms were undoubtedly exaggerated by the presence of a co-existing exophthalmic goitre.) The following morning the temperature had fallen to 102° F., but the pulse was extremely rapid and weak. Abdominal palpation revealed tenderness and marked muscular rigidity in the upper right quadrant, tenderness to pressure over the lower costal arches, and some pain on pressure over McBurney's point and in the costovertebral angle. Blood count showed 16,000 leucocytes, and 79 per cent polynuclears. Urine was abundant, contained a trace of albumin, and a few pus cells.

She was immediately prepared for operation, the diagnosis resting between cholecystitis, subphrenic abscess, or abscess of the liver. An incision through the right rectus muscle revealed no intraabdominal lesion, save a slight redness and œdema of the peritoneum overlying the right kidney. The anterior incision was closed, and the kidney exposed by a lumbar opening. The perirenal fat was œdematous, the kidney was highly congested, and its cortex studded with dark-red lesions. Nephrectomy, followed by an intravenous infusion of 1500 c.c. of normal salt solution. After removal, the kidney was bisected and found to be the seat of numerous infarcts and minute abscesses.

Cultures taken from a freshly opened abscess gave a growth resembling the colon bacillus, but on further investigation it was found to be a non-pathogenic organism, probably a contamination. The patient made an uninterrupted recovery, the temperature falling to normal immediately after operation.

It will be observed that in both of these cases, the symptoms and signs strongly pointed to an intraperitoneal septic focus, rather than to a lesion of the kidney. In fact, in the second instance, I felt so sure of the diagnosis that no cystoscopic examination was made.

The next group of cases may be classed as the intermediary type, for the reason that while the initial symptoms may be as severe, the evidences of grave and progressive toxæmia are wanting.

These cases, like the preceding group, often simulate in their symptomatology, appendicitis, cholecystitis, or abscesses of the liver. If unrecognized and unrelieved by appropriate treatment, they go on to the formation of the more definite and more easily recognized text-book lesions, as renal abscess, perinephritic abscess, pyelonephritis, or pyonephrosis.

In not a few instances, where the local pain is mild in character, or where the mind is clouded by the toxæmia, fever is the only symptom which attracts the attention of the medical attendant, and in these cases a diagnosis of typhoid fever is not infrequently made. The lesions in these cases, while the same in general character as in the severe type, are fewer and more scattered, and the amount of renal tissue involved is less. Stripping the capsule from the affected organ when the lesions are small, or combined with the opening and draining of cortical abscesses or areas of necrosis when present, constitutes the best treatment. In certain instances where the treatment has been delayed too long, the suppurative process continues and a secondary nephrectomy may be necessary.

Six cases of the intermediary type have been operated upon by the writer. All were decapsulated. In two cases, in addition to the decapsulation, several cortical abscesses, or areas of softening and necrosis, were opened and drained by gauze tape. All made satisfactory recoveries, although in the drained cases the con-

valescence was slow, and in one the temperature persisted for several weeks.

The following examples are fairly representative of this class. A female patient, aged thirty-two years, was sent in with a diagnosis of acute appendicitis. The attack began by a severe right-sided abdominal pain, high fever, and prostration. There was marked muscular rigidity over the appendix and gall-bladder regions, with tenderness both in front and in the costovertebral angle. In this instance, the urinary analysis showed no red cells, only albumin and a few leucocytes. The temperature on admission was 102.4° F.; pulse 120; leucocytes 20,400. Although the temperature fell to 99.5° F. during the night, she was prepared for operation. An anterior incision was made, and the gall-bladder and appendix found to be normal. This was closed and a lumbar cut revealed a large polycystic kidney, studded with minute infarcts and small abscesses. As the toxic symptoms were already beginning to subside in this case, and as there was a strong probability of there being a polycystic, and possibly imperfectly functionating kidney on the opposite side, we punctured several of the larger foci and stripped the fibrous capsule from the organ. She had a slow convalescence, complicated by an embolism of the third division of the right pulmonary artery. The recovery was, however, complete.

A woman, aged twenty-six years, complained of right-sided abdominal pain, with nausea, headache, fever, and general prostration. Ten days later she was admitted to the Roosevelt Hospital; temperature, 102° F., pulse 120; leucocytes 19,000, of which 81 per cent were polynuclears. She complained of a bearing-down sensation on urination. The following day the temperature rose to 104° F., 82 per cent polynuclears on differential count. The patient was then cystoscoped. The examination of the bladder negative; ureters were catheterized, and from the right there was a scanty flow of urine, containing albumin, a few pus cells, and blood; from the left more abundant flow, few red cells, practically no pus. Physical examination revealed tenderness in the right costovertebral angle. The kidney was not palpated. Left side free from tenderness. Operation was performed by lumbar incision; œdema of perirenal fat. Kidney was highly congested and presented six distinct cortical areas of induration. Each of these was opened and packed with separate strips of gauze tape, which were allowed to protrude through the partly closed parietal wound. Of the six lesions, only one contained pus; the others, necrotic tissue. The renal pelvis was opened; the mucous membrane appeared normal. Cultures made from the pus showed the bacillus coli communis. The patient made a tardy but complete recovery.

To remind my readers that one may occasionally be mistaken regarding the virulence of a given case, I will relate the history of a patient whose symptoms and appearance seemed to warrant treatment less radical than nephrectomy.

A married woman, aged thirty years, had a severe chill, followed by high fever, prostration, and abdominal pain. When seen by her attending physician, there was marked muscular rigidity and tenderness over the entire right half of the abdomen, the point of greatest tenderness being immediately over the middle of the ascending colon. When seen by the writer in consultation, there was also found marked tenderness in the right costovertebral angle. She was immediately transferred to the Roosevelt Hospital, where upon examination, the urine was found to contain a trace of albumin, a few red blood corpuscles, and pus cells. Temperature was 103° F.; pulse 120.

On exploring the right kidney by lumbar incision, it was found to be œdematous and highly congested. Two or three fair-sized cortical abscesses were found and numerous smaller infarcts. The capsule was stripped from the kidney, the larger abscesses incised and packed with gauze, the wound partly closed, and an intravenous infusion of salt solution given. There was a marked temporary improvement in the symptoms. The temperature and pulse fell, and she seemed brighter, but the pain continued and she required morphine in considerable quantities for its relief. Two or three days later the temperature began to rise, the pulse increased in frequency, she became restless and delirious. We hesitated to remove the kidney on account of the uncer-

tainty regarding the functional competence of the opposite organ.

Her sepsis continued to deepen, however, the tongue became dry and brown, the urine diminished in quantity, the delirium increased; she became more and more prostrated. As it was evident that she would surely die unless the kidney were removed, nephrectomy was hastily performed. The operation was associated with a considerable loss of blood from the slipping of a ligature on the renal pedicle. The loss was immediately made up by a large intravenous infusion of salt solution, which undoubtedly had a favorable effect on the profound toxæmia. The relief was striking, the pulse improved, the temperature gradually fell to the normal, the mind cleared, and convalescence was finally established. Although many months elapsed before she was completely restored to health, her recovery was, in the end, complete.

It remains for us to consider for a moment the mildest type of the disease, which requires no operation, and is of surgical interest only on account of the fact that it accounts for certain cases observed by all surgeons in which, during or after a presumably typical attack of subacute appendicitis, or cholecystitis, operation reveals no lesion or sign of recent inflammation.

The following case will serve as an example:

A young lady, aged twenty-five years, experienced an attack of right-sided abdominal pain, with fever, vomiting, tenderness, and muscular rigidity over the right lower quadrant. These symptoms had been preceded by a subacute attack follicular tonsilitis. Her attending physician regarded the case as one of appendicitis, and asked me to see her in consultation, with a view to operation. At the time of my visit the temperature was 100° F., pulse 110. There was a slight tenderness over McBurney's point, which extended nearly upward to the costal border. The muscles were moderately rigid. There was marked tenderness in the costovertebral angle. As no urinary analysis had been made, I declined to operate upon her, on the ground that, in my opinion, the lesion was a unilateral hæmatogenous renal infection. I ordered an examination of the urine, and predicted that a trace of albumin would be found, a few red cells, and pus, if the specimen was precipitated by the centrifuge. The analysis proved this prediction to be correct. The patient made a satisfactory recovery without operative treatment. This mild type of the disease is also of occasional interest in that it accounts for certain irregular periods of temperature occurring during convalescence from some surgical condition or infectious disease.

In these mild cases, pain is not often a prominent symptom and may be absent, the only sign being a unilateral costovertebral tenderness to pressure.

As an illustration of the latter condition, permit me to cite the following case:

Mrs. X, aged forty-six, was operated upon for a subacute appendicitis, in May, 1906. During convalescence, after the temperature and pulse had been normal for several days, she complained of headache, pains in the back and extremities, chilly sensations, and fever. The temperature rose to 101° F., or more, and the pulse was accelerated.

Examination of the wound area was negative, primary healing having occurred. Examination of the throat, ears, heart, and lungs revealed nothing abnormal.

During a rather careful and systematic examination of the abdomen, distinct tenderness to pressure was found over the left costovertebral angle.

This led to a careful examination of the urine, which revealed a trace of albumin, a few red and white cells. Cystoscopy and catheterization of the ureters later gave the characteristic signs of an acute infection of the left kidney, the secretion from the right side being normal.

She made a prompt recovery from the acute attack, but signs of a mild chronic nephritis persisted for many months.

In conclusion, permit me to say a few words regarding diagnosis. The disease may or may not be ushered in by a chill. When present, it generally indicates a severe type of infection. The initial rise of temperature is high, generally 104° F, or 105° F., pulse is frequently 120, or above. The toxæmia is marked from the first, and, with the high fever, suggests often an acute grip, lobar pneumonia, or one of the exanthemata. Then follows a more or less vague pain in the abdomen, or flank, corre-

sponding to the side of the lesion. Tenderness and muscular rigidity over the region of the appendix, or gall-bladder, leads often to error in believing one of these organs to be the seat of disease. As the urinary secretion from the infected kidney is greatly diminished, and is largely diluted by the abundant secretion from the unaffected organ, the mixed urine, when passed or drawn from the bladder, is often quite normal in appearance, and the slight trace of albumin, blood, and pus, is often overlooked unless a more than ordinarily careful examination is made.

The one pathognomonical sign present in all cases is a marked unilateral costovertebral tenderness.

RESULTS OF OPERATION ON THE KIDNEY FOR TUBERCULOSIS AND CALCULUS

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THE final outcome of our surgical endeavors is apt to excite wider interest than does the immediate result of our operations. The latter may appeal more strongly to the surgeon pure and simple, but the profession at large, and certainly the public, are more intensely interested in the final cure of the patient. The mortality rate of most operations, is known with as great exactness as is possible, considering the differences in the personal equation of the operator and the general hygienic and domestic conditions of the patients. Less certainty, however, prevails as to the final results of our operations.

It is, therefore, my object in this brief paper, to trace the future life-history, first, of the patients from whom, in past years, a tubercular kidney has been removed; and second, to ascertain the future fate of the kidneys from which calculi have been extracted. In neither of these classes of cases has the writer's experience been very large, but it has seemed to him that the final results of his personal cases might be of some service in reaching conclusions on these two important problems.

TUBERCULOSIS

First, as to the prognosis of patients with a tubercular kidney. Definite figures as to the probabilities of cure under hygienic and climatic treatment are impossible to reach. It is somewhat easier, perhaps, to reach, approximately, at least, the results which follow the removal of such kidneys. We are often brought face to face with the troublesome question, "Shall the kidney be removed? In many cases, of course, this question can be instantly answered. Because of an acute miliary tuberculosis, or because of severe involvement of other organs, operation is at once judged to be inadvisable. On the other hand, the involvement of the kidney may be so slight, that its removal does not seem indicated. Hygienic and climatic treatment appears preferable. This latter statement I believe, will be questioned by a number of surgeons.

We must all, however, acknowledge, I think, that there are many cases occupying a middle ground, where decision as to the proper course of treatment to be pursued, is very difficult. Such decision should rest on conclusions which have been established from actual clinical experience. The more accurately we can answer the following two questions, the more logical will be our advice to these patients:

a. What are the chances for permanent cure of kidneys which have once been affected with tuberculosis?

b. What proportion of patients from whom a tubercular kidney has been removed, make a permanent recovery?

In answer to the first of these questions, the great majority of experienced surgeons believe that complete functional restoration of a kidney that has once been tubercular, is a very unusual occurrence. Garré states that, while long-standing improvement may result from non-surgical treatment, yet it is doubtful if a true

and lasting cure with recovery of the kidney has been accomplished. In this he is in accord with Israel, Schede, Albarran, etc. It is quite true that occasionally the tubercular elements will entirely disappear from the urine of a patient who formerly had a tubercular kidney, and, after the lapse of a few years, this excretion will be clear and normal. Autopsies have explained, how, in some cases, at least, such a favorable condition results. The French have named the process *autonephrectomie*. The kidney, as a secreting organ, is practically or totally destroyed. Shrinkage has taken place, the tubercular tissue being replaced by fibrous connective tissue and the whole organ, with its pelvis, shrunken into a small, hard mass with obliteration of the ureter. Does this shrinkage and destruction of kidney tissue always occur in those patients whose urine has become normal? I do not know if there be any anatomical proof to the contrary. I personally believe, however, that it is quite possible for a kidney, once the seat of small tubercular deposits, so far to recover that it will excrete normal urine — the amount, perhaps, somewhat diminished. The following case is, I think, an example.

J. M. H., male, aged 38, a school teacher. A family history of tuberculosis through several branches. For two years gradual and progressive failure of general health. Loss of flesh. For about the same length of time patient noticed that urine was cloudy, and that micturition gradually became more frequent, both by day and night. In November, 1899, he noticed blood in his urine. This persisted about ten days. Examination of his urine at this time proved the presence of tubercular bacilli. Dull aching pain, with occasional sharp exacerbations, was felt in his right loin. These symptoms, with increasing failure of health, persisted until he entered the Presbyterian Hospital, May 26, 1900, for operation. The right kidney was freely exposed and carefully inspected. On its surface were seen a number of whitish spots, many the size of a millet seed, and a few irregular patches with a diameter of, perhaps, one-half inch. The organ was slightly enlarged. No caseous or broken down areas could be discovered, and the consistency of the organ was regular and comparatively normal. The decision was reached, that it was too good a kidney to remove, especially as it was possible for the patient to lead an out-door life for as long a time as was needed. The organ was therefore replaced, without an incision or traumatism of any kind being made. Recovery from the operation was rapid. The patient has since led an hygienic out-door life, and rapidly regained and increased his weight. He has enjoyed perfect health for the past seven years. Micturition is normal in frequency. The urine is perfectly clear and normal in amount, containing no trace of either albumen, pus, or tubercular bacilli. Eight years have elapsed since the operation, and I think the patient can be considered cured.

In answer to the second question, as to the number of recoveries after nephrectomy for tuberculosis, there are more facts at our disposal from which we can draw legitimate conclusions. The experience of Israel[1] has been, by far, the largest. He reports 94 nephrectomies for tuberculosis. Out of 70 of the surviving patients whom he had been able to follow, marked improvement, with decided increase in body weight, had resulted in 47. He was able to report 15 of these patients as alive and apparently cured, at periods from 5 to 15 years after the nephrectomy. It is of interest to note that, in not a single instance where the remaining kidney was healthy at the time of operation, did it later develop tuberculosis. Facklam[2] collected 88 cases where nephrectomy had been performed for tuberculosis. Of these, fourteen patients were well at the end of more than three years after their operations. Schede[3] reported 25 similar cases with nine recoveries.

Out of 54 nephrectomies which I have performed for various causes, 19 have been done for tuberculosis;[4] of these, two patients died before leaving the hospital (one on the 10th, and one on the 21st day).

There were no fatalities due to shock. Of the 17 surviving patients, I have been unable to trace three of them (the population of New York City is so migratory that the tracing of the hospital patients is always extremely difficult). Five of these patients have, apparently, made a permanent recovery.

One patient well at the end of 19 years.
One patient well at the end of 14 years.
One patient well at the end of 12 years.
One patient well at the end of 11 years.
One patient well at the end of 9 years.

Two other patients are apparently free from any tubercular disease at the end of four years,

[1] Centralbl. f. Chir. No. 15, 1905.
[2] Arch. f. klin. Chir. bd. AB, 193.
[3] Bergmann's Handbuch der practisch. Chirurgie.
[4] Two other operations have been performed within the past two years and are not mentioned in these statistics.

and two years respectively, but I have preferred to judge of results only after the expiration of five years from the date of operation.

Of the other eight patients:

One died in 12 months from general tuberculosis.

One died in 20 months from general tuberculosis.

One died in 15 months from an accident.

One died in 18 months from pneumonia.

One died in 23 months from pulmonary tuberculosis.

Two died in 30 months from some wasting disease, nature unknown.

One died in 36 months from tuberculosis of the remaining kidney.

One died in 38 months with symptoms of nephritis.

Judging from the above statisitics of 226 nephrectomies, with 53 apparent recoveries, and, adding to these 100 other cases which I have collected from other sources, we may conclude, I think, that about 20 per cent of those patients from whom a tubercular kidney has been removed, have made a permanent recovery. In this connection, it should be borne in mind that many of these patients were in an advanced stage of tuberculosis, indeed, in a certain proportion, the chances for radical cure could scarcely be even imagined. In this respect, recent years have wrought an improvement, for patients are now brought at an earlier stage of their disease to the surgeon. Methods for the determination of tubercular disease in the urinary organs, are also much improved. We may, therefore, hope that in the future the results of operations may show a more favorable ratio than that of one in five.

A brief history of the patients "cured" is as follows:

CASE 1. J. H., male, aged 32. For three years urinary symptoms. Frequent urination and colicky pain in left loin, Urine often contained "matter" and blood. Operation, October 26, 1889. Nephrectomy. Large kidney with many small broken down tubercular deposits. Good recovery. At the end of nineteen years patient was in excellent health, with normal urination.

CASE 2. E. M., aged 38. For several years miserable. Dull pain in left loin. Later, frequent urination, and mass appeared. Kidney large and tender. Urine contained pus and blood. Operation, May 24, 1893. Nephrectomy. Caseous tubercular deposits and pus pockets. Slow recovery, but in May, 1907, is perfectly well and urine normal.

CASE 3. A. B., female, aged 29. For two years had suffered from vague pains in right loin. Urination frequent specially at night. Blood seen in urine. Kidney enlarged and tender. Tubercle bacilli, blood and pus in urine. Operation, October 29, 1895. Kidney large, contained several tubercular deposits. Good recovery. Reports herself, May, 1908, as in good health, with normal micturition and urine free from abnormal elements.

CASE 4. N. C., male, aged 14. For months frequent micturition and pain in loin. Urine contained tubercle bacilli, blood, and pus. Operation, August 30, 1896. Nephrectomy. Tubercular deposits throughout kidney. Good recovery. At present time, May, 1908, patient is well and urine is normal.

CASE 5. E. C., female, aged 37. For 18 months dull pain in right loin, frequent urination and marked loss of flesh and strength. Kidney enlarged and tender. Operation, July 6, 1887. Nephrectomy. Large kidney with three tubercular foci. Slow recovery. For three years remained feeble and then regained her health. At the end of nine years strong and well. Urine normal.

CALCULI

It has seemed wiser not to discuss in this paper all my cases of operation for renal calculi (45). If the cases which were complicated by septic or pyonephrotic conditions were included, I fear that attention might be diverted from the main object, that is, the behavior of those kidneys whose main lesion was the pyelitis due to the presence of a stone. I have performed fifteen operations of this character. In twelve, the stone was situated in the renal pelvis and in three in the ureter. I have endeavored in these patients to trace the final results, both as to their general health and as to the ultimate condition of their kidneys. Of the fifteen patients, we know that 11 have made a perfect recovery. In Case A, the history of which I will briefly relate, nephrectomy on the 26th day was required because of renal hæmorrhage, which began on the 21st day after operation.

In another patient, the kidney symptoms never disappeared, and nephrectomy was needed four months after the nephrolithotomy. One patient has not been found. Twelve patients have practically recovered their health; in one only, there being still occasional pain and abnormal urine. In the other 11 patients

there is no trace of bad symptoms attributable to the kidney, and the urine in all is normal.

In connection with the operation of nephrolithotomy, there is one point of special interest: Shall the calculus be extracted through an incision made in the pelvis of the kidney or through one made in the parenchyma of that organ? There can be no categorical answer to this question, for there are stones lying in the pelvis of the kidney, which are so great in size that extraction through the parenchyma of the kidney would be unwarranted because of the necesssary injury of tissue during their removal. On the other hand, there are stones with tapering processes running up into the calices, for the removal of which, the kidney must necessarily be incised. Given, however, a small or moderate sized stone situated in the pelvis, how shall it be extracted? My original practice was to extract it through an incision made in the pelvis directly down on the stone. In later years, however, influenced by the teaching of most surgeons, it has become my practice to split the kidney and remove the stone directly through the incision in its parenchyma. The incision in the kidney is then closed by fine catgut sutures. I have found but little inconvenience, and never any danger, from hæmorrhage. While the kidney is held in one hand, the incision is made with the other, and thus all bleeding can be perfectly controlled during the extraction of the stone. The incision is at once sutured with interrupted sutures of fine catgut placed about three to the inch, and tied loosely, so that kidney parenchyma may not be damaged by constriction of the sutures. This method of suturing has, invariably, controlled the bleeding. Fine catgut, which will last but a few days, is employed, so that if the tension in the pelvis be too great, the kidney may burst open, and so relieve itself externally. In but one case in seven has this occurred. In cases where the question of drainage has been in doubt, the kidney is more tightly sutured than in cases where drainage is clearly unnecessary.

While my cases are not sufficiently numerous to throw much light on this question, yet it is suggestive that in five patients where the incision was made in the pelvis, leakage occurred in four. In six patients where the incision was made through the kidney itself, leakage occurred in one only. It is not quite fair, however, to judge from these figures that leakage of urine is less apt to follow incisions in the kidney rather than those in the pelvis, because in several patients the wound in the pelvis was but slightly sutured in anticipation of future need of external drainage, whereas the wound in the kidney was always thoroughly closed by suture. It is my impression, however, that there is less danger of leakage when the stone is extracted through the parenchyma of the kidney.

In the majority of patients suffering from nephritic calculi, either the pyelitis is so severe or the kidney itself is in such a state of advanced pyonephrosis that all question of closure of the kidney is at once settled. External drainage is necessary. There are, on the other hand, patients where the kidney itself appears comparatively normal and where the pyelitis is comparatively slight. Drainage seems, under such conditions, to be quite unnecessary. We will always, however, encounter a few cases where it will not be easy to decide whether or not to employ drainage. In all cases we must be sure that the ureter is patent. Drainage is indicated, if there be any sign of disorganization of the kidney itself, or if the calices be much distended, or should the urine have been loaded with pus prior to the operation, or should there have been, at any time, fever or signs of sepsis, or if much damage has been done to the kidney during the extraction of the calculus, or should there have been crumbling of calculus during the process of its extraction, as under these circumstances some small fragments might have been left behind in the calices. Should there be doubt as to the wisest method of procedure, a compromise may be made and the kidney very slightly sutured with fine (oo) catgut so that, should the inflammation of the pelvis be present in such severe form as to demand drainage, nature will come to its relief and burst open the sutured kidney, as occurred in one of my cases.

Renal hæmorrhage occasionally follows the operation of nephrolithotomy. Such hæmorrhages may immediately follow, or occur only after the expiration of some days. Thus, Israel, in 131 nephrolithotomies, experienced

bleeding so severe as to necessitate tamponage of the kidney in 12 patients. The closure of the kidney by sutures is a safeguard against such hæmorrhages. In the one case in my own experience, bleeding was of the late variety. Sutures in the kidney itself had not been employed. Nephrectomy was necessary.

Case A. W. H., male, aged 44. For five years had suffered from pain in back and right loin. Had lost twenty pounds in weight. Urine contained albumen, red and white blood cells. Operation, July 20, 1889. Kidney found somewhat enlarged and congested. Stone felt in pelvis. Extracted by incision directly down upon it through wall of pelvis, size one and a half by half inch. Two catgut sutures lightly united the incision. Drainage tube to kidney. With exception of a slight septic fever for a few days after operation, patient progressed favorably till the 21st day, when hæmorrhage from the wound began. Blood also appeared in the urine. In spite of medication, packing, etc., the renal hæmorrhage continued to be very abundant, the result being to rapidly weaken the patient. At the end of four days it was found necessary to remove the kidney.

Case 1. M. B., female, aged 28. For thirteen years had suffered from more or less constant dragging pain in her right loin. Colicky pain on a few occasions only. No fever. Micturition frequent, sometimes painful. Urine contained 8 per cent pus and many blood cells. Operation, January 6, 1888. Kidney exposed and brought into wound, stone felt in its pelvis. The stone was directly cut down upon by an incision in the pelvis of the kidney. A "mulberry" calculus the size of a small walnut removed, weight 120 grammes. The wound in the pelvis was loosely sutured, and the wound closed except for a rubber drainage tube leading down to the kidney. Leakage of urine followed, and persisted for sixteen days. In another fortnight the wound was closed. Recovery was rapid, and for ten years following general health was excellent and urine normal.

Case 2. J. B., male, aged 47. For several years had suffered from attacks of colicky pain in left loin. Micturition had been frequently painful, and he had noticed blood in his urine. His left kidney was palpable and tender. Urine contained pus and blood. Operation, November 2, 1890. Kidney considerably enlarged and adherent. Stone the size of a hickory nut felt in the pelvis. Incision made through the kidney pelvis, and stone extracted. Wound in pelvis loosely sutured with catgut, rubber drainage tube to kidney. Urine discharged from the wound for eleven days after the operation. Wound was healed on the 27th day. Patient, up to the present time, has remained perfectly well, is free from pain, with normal micturition and urine.

Case 3. S. M., female, aged 23. For seven years occasional colicky attacks of pain in left loin, accompanied by vomiting and fever. Blood noticeable in urine, which contained also pus. Left kidney large and tender. Great nervousness. Operation, May 7, 1892. Kidney enlarged and slightly adherent. Stone felt in pelvis. Incision in dorsum through parenchyma to pelvis. Rough "mulberry" stone extracted, size large pea. Kidney sutured with catgut. "Cigarette" drain. Good recovery. No leakage of urine. Since operation patient has enjoyed perfect health, and urine is (May, 1908) normal.

Case 4. J. R., female, aged 34. For two or three years had suffered from attacks of colicky pain in left loin, always attended by frequent and painful micturition. Occasionally, fever with nausea and vomiting. Urine contained considerable blood and a few pus cells. Operation, August 12, 1893. Kidney deeply situated. Stone felt in its pelvis through which an incision was made. The extracted stone was very rough, as large as a hickory nut. The wound in the pelvis was closed by catgut sutures, a rubber drainage led down to the kidney. No leakage of urine followed. The wound was closed on the 27th day. For seven years the patient was observed, and during that time was in good health, with normal micturition. The urine, for fifteen months after the operation, contained a few pus cells and then became normal.

Case 5. J. S., male, aged 31. For a number of years patient had noticed frequency of, and occasional pain on urination. He had, also, at times, experienced some colicky pains in his left loin. The left kidney region was tender on pressure. Urine contained some pus and blood. Operation, January 7, 1894. The kidney was considerably enlarged. An irregular stone the size of an almond, was felt in the pelvis, with two branches running up into the calices. An incision made through the pelvis rendered the extraction of the stone comparatively easy. The wound was lightly sutured with catgut. A rubber tube was passed down to the kidney. Leakage of urine followed and persisted for nineteen days. The wound healed slowly, and was not cicatricised completely until the 37th day. For six months after leaving the hospital the patient was in fair health. His urine, however, continued to have pus. His lumbar pain then returned, with slight attacks of fever. His kidney became tender. Four months later the kidney was enlarged and very tender. Nephrectomy was then performed. In the calices of the kidney two other small stones were found buried, and the kidney was in a condition of pyonephrosis. Recovery was uneventful.

Case 6. L. S., female, aged 27. For one month had suffered from dull, aching pain in right loin and two severe attacks of colicky pain. Frequently noticed strangury. Once saw blood in her urine. Urine contained a few pus cells and numerous red blood cells. Operation, November 17, 1896. Kidney was easily brought into wound. A small stone felt in the pelvis. Extracted through an incision made through the kidney parenchyma. The kidney was closed by interrupted sutures of catgut. The lumbar wound was closed, with the exception of an opening for a drainage tube. No leakage of urine followed. Wound was healed on the 23d day. Since leaving the hospital the patient cannot be traced.

Case 7. A. B., female, aged 37. For two or three years frequent and painful micturition. Dull ache in right loin. Loss of flesh and strength. Urine contained blood and pus. Operation, March 13, 1898. Kidney slightly enlarged. Stone size of almond felt in pelvis. Incision through parenchyma of kidney. Stone easily extracted. Incision in kidney closed with catgut sutures. Primary union. No leakage of urine. Rapid recovery. Ever since operation patient has enjoyed good health, and urine is (May, 1908) normal.

Case 8. M. S., male, aged 22. For thirteen years had suffered from attacks of colicky pain in right loin. Micturition increased in frequency. Urine contained a few pus and red blood cells. The X-ray photographs showed a distinct shadow in the region of the right kidney. Operation, April 2, 1904. Kidney deeply situated. Could not be drawn into the wound. Incision made partly through the pelvis, and partly through kidney parenchyma, directly down upon a large, branching stone. The branches ran up into the calices, and the kidney substance was somewhat torn in their extraction. On account of the bleeding, a strip of gauze was passed into the opening in the kidney, the pelvic part of the incision being closed by suture. The urine continued to discharge from the wound for 35 days. The wound was completely healed at the end of five weeks. The patient has since enjoyed excellent health, and, at the end of four years, reports himself as perfectly well, free from pain, with normal micturition and urine.

Case 9. M. M., female, aged 14. For five years had suffered from frequent attacks of pain in right loin. More or less nausea and vomiting during attacks. Occasional chill, fever, and sweating. Micturition nearly always painful and frequent. Urine contained a small amount of pus and a few red blood cells. X-ray photograph showed distinct shadows in region of right kidney. Operation, May 25, 1905. Kidney exposed, appeared congested and more adherent to its fatty capsule than is normal. Several stones felt on palpation. Kidney cut open and finger passed into a somewhat dilated pelvis. The largest stone lay in the pelvis, shape oval, size $\frac{1}{3} \times \frac{1}{2}$ inch. Five smaller stones, felt in the apices of the calices, were extracted. Another small stone was then felt in the ureter, three inches below the pelvis. This was milked back and extracted through the kidney. The probe in the ureter then encountered an obstruction near the bladder. With slight pressure, this gave way, a small stone being apparently pushed into the bladder. The wound in the kidney was then closed by a row of interrupted sutures of fine catgut very loosely tied. The lumbar wound was closed in layers throughout, except for a small opening through which a thin cigarette drain passed to the kidney. Primary union resulted, no leakage of urine. Convalescence was uninterrupted. Since leaving the hospital at the end of three weeks, the girl has been perfectly well. Three years have now elapsed. There has been no pain. Micturition has been normal, as is also is the urine.

Case 10. R. S., female, aged 23. For ten years attacks of severe pain in right loin, at irregular intervals, associated with nausea and vomiting. Micturition often painful. Urine contained a few pus cells, and a trace of red blood cells. The X-ray photograph showed two distinct shadows in the region of the right kidney. Operation, December 5, 1905. Kidney exposed and incised; two stones felt in its pelvis. Kidney opened on its convex surface, down to the ureter. Two stones removed, one the size of a small walnut, the other of a pea. Kidney wound sutured lightly with interrupted sutures of fine catgut. Lumbar wound closed except for a small "cigarette drain." Primary union of the wound. No leakage of urine. Convalescence rapid. The girl left the hospital on the nineteenth day after operation, and since that time, two and one-half years ago, has been perfectly well. Micturition normal, as is her urine.

Case 11. S. C., female, aged 37. For several years (five or six) had suffered from attacks of colicky pains in right loin, accompanied by nausea and vomiting. Micturition painful and frequent. Fever generally accompanied the attacks. The pains, gastric disturbances, and fever, had caused marked loss of flesh and strength, and patient had become very weak. Urine contained a few pus and red blood cells. The X-ray photograph showed two shadows in region of right kidney. Operation, October 23, 1906. Kidney enlarged, slightly adherent, and looked congested; two stones felt in the pelvis. Incision through kidney substance from dorsum into its pelvis. The two stones, each the size of a large pea, extracted. The wound in the kidney closed with a few fine catgut sutures. Lumbar wound closed, except for a small "cigarette drain." The patient was very weak for some days following the operation, and developed slight fever. On the sixth day the finger was passed through the drain sinus, down to the kidney. A few hours later there was a discharge of urine, and the temperature slowly fell to normal. Urine continued to discharge from the 6th to the 22d day. The wound was closed on the 30th day, and the patient returned to the country on the 37th. Her improvement was slow and tedious, but at the end of six months she had practically regained her health. Her urine slowly improved, and, at the end of a year, was normal in every respect. It is now eighteen months since her operation, and her health is quite restored.

URETER STONES

Case 1. L. M., male, aged 33. For eight or nine years patient had complained of occasional colicky pain in left side of abdomen. Attacks were accompanied by frequent urination or strangury. On several occasions blood was noticed in the urine. Tender spot just internal to anterior superior iliacs pine. Patient often felt intense pain at this point. Operation, December 14, 1900. Incision intermuscular, just internal to ant. sup. spine of ilium. Peritoneum stripped from iliac bone, and finger soon felt the stone. The ureter was easily isolated, and an incision was made directly on the calculus, which was the size of a large, oval pea. The ureter wound was closed by inter-

rupted catgut sutures. A strip of rubber tissue passed down to the ureter wound. No leakage. Primary union. Patient has ever since been "free from pain, and urine is normal.

Case 2. C. S. female, aged 43. For fifteen years or more patient had suffered from colicky pains in right loin. In past six months pains had apparently started from a point below her anterior superior spine. An X-ray picture showed a faint shadow just below McBurney's point. Operation, April 17, 1902. Incision, intermuscular just below anterior superior iliac spine. Peritoneum stripped from wall of pelvis and finger rapidly located a hard body situated near the brim of the pelvis. The ureter was isolated, and through an incision in its wall, a stone $\frac{1}{2} \times \frac{1}{2}$ inches was easily extracted. The wound was closed by interrupted catgut sutures. A strip of rubber tissue passed down to the ureter. No leakage. Patient has been well ever since, and his urine is normal.

Case 3. D. N., male, aged 38. In 1895, an abscess of the kidney had been opened and drained. Condition at that time very grave, and severe illness lasted many weeks. Since that time health never good. Indefinite pains in pelvis and right lumbar region. Bladder very irritable, Occasional severe attacks of fever and scanty urine. Urine frequently contained pus and blood cells. X-ray showed a shadow on right side, internal to anterior superior spine of ilium. Operation, June 17, 1905. Ureter found embedded in dense cicatricial tissue. Opposite the iliac crest a small, irregular stone was felt. The ureter was incised and a calculus three-eighths inch in diameter extracted. The incision in the ureter was closed by three sutures of fine catgut. The wound was closed, except for a "cigarette" drain. Convalescence was normal. Health slowly regained. The patient is at the present time, nearly three years since his operation, enjoying excellent health. His urine is normal.

CASE REPORT OF PLASTIC REPAIR IN OLD GUNSHOT WOUND OF THE ABDOMEN

By J. K. MARDEN, Marsovan, Turkey

II. Young Turk from Chorun, 22 years old.

Patient was shot through pelvis on right side, bullet coming out one inch above anterior superior spine of ileum. Again the wound healed of itself and a fecal fistula was the result.

An attempt was made in the summer to close the fistula but without success. When the patient came to me in the fall, the opening in the intestine was the size of a dollar. The mucous membrane was prolapsing, and most of the fecal matter was discharging through the fistula.

Operation: Preliminary preparation the same as in previous case.

An incision was made on three sides along the margin, down to the peritoneum. The peritoneum was opened. The omentum was adherent and had to be be tied-off. The wound was found to be in the caput cæcum. Adhesion held it down to the pelvis; and it was impossible to raise it out of the abdomen without risk of extensive tear of the intestine or injury of the ureter. So the edges of the intestinal wound were freshened; a continuous catgut suture from the inner side closed the fistula. Then Lembert stitches were used as usual.

Considerable difficulty was found in closing the deepest part of the intestinal wound, as the tissues were more friable. In order to re-enforce this weak spot, the vermiform appendix, with its mesentary were twisted around, and with fine catgut, stitched over this weak place.

Again there was great difficulty in closing the abdomen with proper support. The gap between the muscle walls was more than two inches. A curved incision through the skin and muscle was made in the lateral abdominal wall beyond the wound. The attachment to the rim of the pelvis was left intact as well as the superior attachment, and the flap slid along. Even then, there was much tension on the stitches in closing the abdomen. A small drain was introduced through the new lateral wound down to the weak place in the sutures of the colon. The peritoneum had been approximated as far as possible and at the lower margin had been stitched to the ascending colon, with fine catgut to wall-off the peritoneal cavity.

The patient made a fine recovery and in four weeks left the hospital perfectly healed.

TRANSACTIONS OF SOCIETIES

MEETING OF THE AMERICAN SURGICAL ASSOCIATION

At Richmond, Virginia, May 4-6, 1908

The President, William H. Carmalt, M. D., in the chair.

OFFICERS ELECTED

President — Dr. C. B. G. DeNancrède, Ann Arbor, Michigan.

Vice Presidents — Dr. A. C. Gerster, New York City, N. Y., Dr. Leonard Freeman, Denver, Colorado.

Secretary — Dr. Robert G. LeConte, Philadelphia, Pennsylvania.

Treasurer — Dr. Charles A. Powers, Denver, Colorado.

Recorder — Dr. Richard H. Harte, Philadelphia, Pennsylvania.

Place of next meeting, Philadelphia.

For the address of the president, see p. 617.

REMINISCENCES OF THE EARLY DAYS OF THE AMERICAN SURGICAL ASSOCIATION BY ONE OF ITS FOUNDERS

J. Ewing Mears, M. D., of Philadelphia, spoke of the beginning of the Association, and placed on record some of the notable occurrences of its existence. Reference was made to its influence on surgical science in this country and of its development in the future. An account was given of the early meetings of the Association and a tribute paid to its founder, Dr. Samuel D. Gross. With Drs. P. S. Conner, W. W. Keen, and Solon Marks, Dr. Mears is the fourth of the survivors of the original Fellows of the Association. An appreciation was given of Dr. J. Collins Warren. The author considers it an open question whether or not a fixed place of meeting would not contribute to a more serious execution of the scientific work of the Association, and it is suggested that the selection of a permanent place of meeting might result in the erection in the City of Washington of a building suitable for its purposes. This would also provide quarters for the future accumulation of surplus volumes of the Transactions and the Archives of the Association. A notable event which had its origin in the Association was the movement resulting in the foundation of the Congress of American Physicians and Surgeons, carried forward by Dr. Claudius H. Mastin. Another event of special interest was the erection of a bronze statue of the Founder of the Association in the City of Washington.

SURGERY OF THE GASSERIAN GANGLION

For paper by Dr. Stephen H. Weeks, of Portland, Maine, see p. 607.

Dr. Maurice H. Richardson spoke of the interest and value of Dr. Mears' paper. He urged that, in the discussion of the scientific papers, the unfavorable, as well as the favorable, side should be given.

Dr. A. Vander Veer, of Albany, agreed with Dr. Mears that no other man could have done the work executed by Dr. Samuel D. Gross in the organization of the American Surgical Association.

Referring to Dr. Weeks' paper, he has done successfully several times the operation for the removal of the Gasserian ganglion for trifacial neuralgia. Hæmorrhage has always been to him an important element in this operation.

Dr. S. J. Mixter, of Boston, does the operation for the removal of the Gasserian ganglion in two stages. While the method is not so brilliant as the one stage, he thinks it better for the patient

Dr. Weeks, in closing, said he had operated four times and all the patients had recovered. In one case in which, at the time of operation, a small portion of the brain escaped, nothing untoward followed. Later, since the writing of his paper, the patient reported that she had some difficulty in pronouncing certain names.

PERFORATIVE PERITONITIS, ACUTE, GENERAL, FREE

For paper by Dr. John B. Murphy, see p. 565.

Dr. John B. Deaver emphasized the necessity of attacking the condition early, and of doing as little as possible in the matter of manipulation. He has no hesitancy in reopening the abdomen for obstruction. In ten consecutive cases all recovered. Short anæsthesia he regards as important. He uses eserin reinforced with strychnia. In some cases there has been slight cardiac disturbance from the eserin. He has no hesita-

tion in setting his patients up in bed. Concerning the giving of morphia, he "does not know what a hypodermic syringe looks like for the purpose of giving morphia."

Dr. A. G. Gerster, of New York, within the last two years in his hospital service, has abandoned methods of irrigation and mopping, formerly employed, and has followed the plan laid down by Dr. Murphy, with the Fowler position, and the results have been markedly improved. He has used eserin in the treatment of tympanitis following diffuse peritonitis, but is not so enthusiastic concerning the results as others are. Contributory to the improved results in the treatment of general peritonitis are the facts of improved technique, early recognition of cases, and the inclusion in the group of general peritonitis of cases easily cured by proper treatment. He described a simple modification of the enemata by which the irrigating rectal injection is carried high into the rectum and, after being allowed to escape, repeated. Peristalsis is thus accomplished and large quantities of gas allowed to escape. He finds it more effective than the use of eserin, and, being a mechanical procedure, may be safely left in the hands of the nurse. He thinks Dr. Deaver's stand in regard to the giving of morphia an extreme one. While the excessive administration of morphia is wrong, the entire withholding of it he regards as unnecessary and cruel.

Dr. Arthur D. Bevan, of Chicago, in some cases of fluid in the peritoneal cavity, employs a female glass catheter, using it as a pipette, taking up the pus, not only in the cul-de-sac, but in other directions. Many cases in which there is a free pus, and cases of duodenal ulcer operated upon early in which there is a considerable amount of fluid, are regarded by him as cases in which general peritonitis has been prevented by early interference, and not cases of general peritonitis. This obviously has a determining influence upon statistics. He has found nitrous oxide gas of much value as an anæsthetic. Frequently, the giving of either ether or chloroform in these cases turns the scale between recovery and death. He disagrees with Dr. Murphy regarding the danger of washing out the peritoneal cavity, believing that irrigation is good surgery, and that it can be done without loss of time. In the matter of drainage, he favors the large cigarette drains in preference to rubber tubing.

Dr. Dudley P. Allen, of Cleveland, agrees that the washing out of septic material is a valuable aid in treatment. He places the patient on the side when draining, to have the aid of gravity, and limits the washing to the area involved.

Dr. Joseph Ransohoff, of Cincinnati, feared that, if the dictum went out to the general profession that free general peritonitis recovers in the proportion of 44 to 3, the average practitioner would delay in seeking surgical aid with the thought in mind that if the patient did get worse, he had 44 out of 47 chances of getting well. He asked Dr. Murphy, in closing to state in how many of the 47 cases the operation was done after four or five days subsequent to the development of symptoms of general peritonitis, and in how many cases he operated in which death seemed imminent.

He called attention to the general use of the word peritonitis, suggesting that but few understand by the term exactly the same thing. Free fluid in the peritoneum is not necessarily infected, and its presence should not be regarded as evidence of peritonitis until cultures show infection.

Dr. A. T. Bristow, of Brooklyn, showed a device which regulates the passage of the fluid to about 90 drops per minute in rectal irrigation.

Dr. George E. Armstrong, of Montreal, has followed the teaching of Dr. Murphy in the treatment of peritonitis with very great improvement in results. He attaches great importance to induced drainage by rectal injection in the sitting position. In two cases recently under his care, with persistent vomiting and with swelling in the epigastric region, thinking the condition due to retromesenteric pressure on the transverse duodenum, he reversed the position of the patients from the Fowler to the Trendelenburg with satisfactory results.

Dr. John C. Oliver, of Cincinnati, inquired of Dr. Murphy whether his method of treatment had been applied to gunshot wounds of the abdomen, especially to those cases in which injury had been inflicted several hours before operation. He asked because, while there might be an honest difference of opinion concerning the forms of peritonitis following appendicitis or perforated gastric or duodenal ulcer, all agree that the form of peritonitis following gunshot wounds is apt to be general. Therefore, the results of treatment in that class would be of value.

Dr. James E. Moore, of Minneapolis, said he had no word of criticism of Dr. Murphy's paper, wishing only that he was able by any means to secure results so good. He protested against the dictum laid down by Dr. Deaver that abdominal cases should be deprived of morphia. Concerning this question, he said his position was like that of the old man who, when he came to die, told his son he *knew* honesty was the best policy because he had tried both ways. In the beginning of his abdominal surgery he had withheld morphia, but

after having had an operation himself he insisted upon having morphia. He has since given it to his patients and his results are improved.

Dr. Maurice H. Richardson, of Boston, said that peritonitis still remains the most important disease with which he has to deal, causing more deaths in his own cases, those of his colleagues, and in literature than any other diseases. He referred to the evolution in treatment from the time when a man's abdomen was made to look like a colander to the present, when a small incision and very little disturbance of the abdominal viscera are the rule. He could criticize only in the most favorable way Dr. Murphy's method. In his hospital service he does not know that they use the method exactly, though they do not disturb things very much. They do not wash out. They do not wipe extensively. They do not make multiple incisions. They depend upon rectal lavage, and, rather than have patients toss all night, they give small doses of morphia.

Dr. John B. Roberts, of Philadelphia, said that Dr. Murphy's brilliant paper disproved effectually the oft repeated statements of those operators, who, for years, have contended that all cases of perforative appendicitis and similar lesions should be treated by an *insistent* search for the offending organ. Also, it has shown effectively their error in believing that patients after abdominal section or with peritonitis from perforation should be tortured by persistent immobility in the dorsal recumbent position, by absolute deprivation of water, and by the ante- and post-operative withholding of morphia and pain-obtunding drugs. Dr. Murphy's results thus justified those who, for twenty years, have contended against such surgery.

Dr. Richard H. Harte thought it obvious that no hard and fast rules could be laid down in the treatment of peritonitis, each case being treated rather according to the conditions found. He thought error sometimes existed in the use of rectal irrigation in not having the tube of sufficient size, and held at a proper height to favor the ready flow of the fluid toward the bowel. He described a frame made to support the weight of the patient by the buttocks and thighs, as a satisfactory method of maintaining the Fowler position. He approves the plan of having patients sit up, even in the typhoid perforation cases in which the perforation occurs at the end of a very long illness. He favors gauze for drainage rather than tubes.

Dr. M. L. Harris, of Chicago, has tried repeatedly the principles laid down by Dr. Murphy and his patients get well. Relative to the inquiry of Dr. Allen concerning gunshot wounds of the abdomen, he had had within a few months, 17 cases of these wounds, involving the intestines in which there were from one to eight perforations. Every case was operated upon early, all were drained and all recovered.

Mr. G. B. A. Moynihan, of Leeds, England, said that at the Leeds' Infirmary they grouped their cases according to those occurring previous to their having learned of Dr. Murphy's treatment, and those occurring subsequently. Those of the former group they had been accustomed to lose Those of the latter usually recovered. Only in very insignificant particulars do they vary from the method laid down by Dr. Murphy. They operate in the least possible time; in drainage, employ what they term the split tube. This is a large sized rubber tube, split along the wall of one side which, when in position, drains along its whole length and can collapse if pressure from tissue occurs. He takes issue with Dr. Deaver in the matter of morphia, a small hypodermic being given in every case before the patient leaves the operating table. No house physician, however, is allowed to repeat the dose without instruction from his superior officer. They usually do not employ general anæsthesia, but operate under stovaine with lumbar anæsthesia. An advantage of this method is the passing of abundant quantities of flatus. This makes the operation distinctly easier. The patients are placed in bed in an exaggerated Fowler position. The position is maintained by a bolster beneath the buttocks and thighs, attached to the head of the bed. No restraint is put upon the amount of water the patient desires to take, for the nurse leaves a vessel containing water on the table beside the bed.

Dr. Murphy, in closing, emphasized his positive conviction that every case of general perforative peritonitis ought to get well, if properly handled. Such handling, however, involves timely and intelligent action, and the following of definite lines to attain results. Answering Dr. Ransohoff's question, he said he did not have any cases of four or five days duration since the beginning of the symptoms of *general peritonitis* and trusted he never would have, but often four, five, and six days had elapsed since the onset of the *appendicitis*. All cases should be operated under twenty-four hours, and under twelve would be better, as the diagnosis is possible in the great majority of cases. When surgeons appreciate this fact, the same results as seen in early operations for appendicitis will obtain in peritonitis. Dr. Murphy does not make the differentiation of Dr. Bevan between the type of of cases with intestinal leakage *without* peritoneal inflammation, and the type with intestinal leakage

with peritoneal inflammation, as all of his were of the latter type. He considered the points brought out by Dr. Harte of great value as emphasizing the necessity of attention to details. The presence of a yellow creamy fluid in the peritoneum does not constitute peritonitis. There must be a perforation of the gastrointestinal canal and a direct communication from the lumen of the canal into the free peritoneal cavity. The free yellow creamy fluid is often a defensive fluid carrying away infective organisms. Dr. Harris's results with perforating gunshot wounds of the abdomen emphasize more than word can do the importance of early operations, complete closure, absence of irrigation, Fowler position, and proctoclysis. The short duration of the anæsthesia as brought out by Dr. Bevan, he regards as important and the operation under nitrous oxide is commendable.

The stovain analgesia, as used by Mr. Moynihan, had the double advantage of analgesia and the stimulation of intestinal peristalsis.

The method for stimulating peristalsis, suggested by Dr. Gerster, should have wide-spread adoption as gas elimination is of great value.

In support of Dr. Deaver's position, Dr. Murphy stated that his cases had been conducted both before and after operation without morphine.

LATE RESULTS (TWO YEARS OR MORE) AFTER OPERATIONS FOR BENIGN DISEASES OF THE STOMACH AND DUODENUM

Mr. B. G. A. Moynihan, M. S., F. R. C. S., of Leeds, England, in estimating the value of surgery in non-malignant diseases of the stomach reviewed the records of his operated cases to the end of 1905. They are 281 in number and are classified as follows:

1. Perforating ulcer of the stomach or duodenum.
2. Cases for which hæmorrhage has been the immediate cause of urgent interference.
3. Cases of chronic ulcer, etc.
4. Cases of hour-glass stomach.

Of the 281 patients, recent information is at hand in reference to 265 cases. In class 1, of 27 cases of perforating ulcer operated upon, 18 patients recovered. In class 2, 27 patients submitted to operation for acute hæmorrhage, 23 of whom recovered. In class 3, the patients number 205; among them were 2 fatal cases and 214 operations. A very full classification is given for analysis. In class 4, there were 22 cases made up of 7 males and 15 females. The total mortality in this group is 3.

A summary of the number of cases in all the groups gives the following results:

	Total No.	Recurrence	Died	Other Dead	Cured
Group 1	27	3	2	2	19
Group 2	27	3	0	0	19
Group 3	205	20	2	15	150
Group 4	22	1	1	1	17
	281	27	5	18	211

The present condition of all the patients now alive is as follows: Two hundred and eleven patients are cured, 9 are improved, 12 are no better, 9 are doubtful, 6 not recently reported. Thirty-four patients are dead; 18 as a result of the operation, 7 of carcinoma of the stomach, 9 from other causes unconnected with the disease of the stomach or the operation performed for its relief.

Among the lessons to be drawn from the history the following points are submitted: That the operative treatment of stomach disorders should be confined exclusively to those cases in which an organic lesion is present. In cases of acute perforating ulcer, the perforation should be closed or the ulcer excised. When the ulcer lies upon the lesser curvature, nothing more is necessary than this. When a non-malignant lesion is discovered, the treatment appropriate to it depends upon its position in the stomach. If the ulcer be prepyloric, pyloric, or duodenal, gastroenterostomy should be performed. It is desirable also to infold an ulcer whenever possible. The most satisfactory method of gastroenterostomy is the posterior no-loop operation, with the almost vertical application of the bowel to the stomach. Regurgitant vomiting occurs as a result of the "loop" operation, whether anterior or posterior. It is relieved almost certainly by an enteroanastomosis. In cases of hour-glass stomach the surgical treatment necessary presents special difficulties on account of the frequency of a dual lesion, one in the body of the stomach, one at the pylorus, and double operations have consequently to be frequently performed.

A STUDY OF GASTRIC AND DUODENAL ULCERS WITH ESPECIAL REFERENCE TO THEIR SURGICAL CURE

William J. Mayo, M. D. This paper is limited in its scope to a discussion of gastric and duodenal ulcers with a view to presenting some facts as to their surgical cure.

In the following series the average duration of pre-operative symptoms was over twelve years. Operations were not performed until medical treatment had proved ineffectual.

No cause for conflict between medicine and surgery in this field, as only the cases that fail to yield to *reasonable* medical treatment should be considered surgically.

In the earlier surgical treatment some of the patients were not relieved of their symptoms because of technical errors, but the larger number

of failures were due to faulty diagnosis and the fact that operations were performed when there was no ulcer present, but rather gall-stones, appendicitis, atonic dilatation, or prolapse.

Two years of time at least should elapse after operation before the patients can be safely pronounced cured.

All cases of ulcer and kindred diseases of the stomach and duodenum, operated upon by Drs. C. H. & W. J. Mayo, since the first case in 1893 to May 1, 1908, are classified; but special investigations and statistics are confined to the ulcer group.

Total number of operations to May 1, 1908, is 827. Total number of patients operated upon, 768. Of this number there were 225 cases of benign lesions other than ulcer. This leaves 543 cases operated upon for ulcer of the stomach and duodenum. Twenty-seven of these were for acute perforations, and of those in which the closure of the perforation alone was made, but one required secondary gastrojejunostomy. All the others have remained well, the perforation having seemingly put an end to the disease.

Twice in chronic cases the base of the ulcer has been cut out, producing an effect similar to acute perforation. The defect was closed and good results obtained.

The surgery of chronic ulcer can be divided into three periods:

First period, previous to 1900. The surgery of benign obstructions. Two methods of operation were employed, gastrojejunostomy and pyloroplasty. Operative mortality was about six per cent.

Second period, from 1900 to and including 1905. Technical improvements and the invasion of new fields. Results in this period did not compare favorably with the early period in which the problem was purely one of mechanics arising from obstructive interference with gastric drainage, or with the third period in which technical errors had been largely eliminated and a sound pathological basis substituted for fallacious clinical observations.

At this time gastrojejunostomy was too often performed when no ulcer could be found and the result recorded as operative failures to cure instead of mistakes both in diagnosis and operation, which was the fact.

In reoperating for trouble of this description, we have cut off the gastrojejunostomy and closed both sides, restoring the gastrointestinal canal to its normal continuity.

The danger that *ulcer* would degenerate into *cancer* stimulated excision of gastric ulcer. Indications for excision do not apply to duodenal ulcers, since they seldom undergo malignant change.

Posterior gastrojejunostomy gradually replaced the *anterior* as the popular method. The loop has been eliminated and a large number of American operators, including ourselves, no longer turn the jejunum to the right, but suture it to the stomach as it runs normally downward and to the left.

We have made over 300 gastrojejunostomies for ulcers of the stomach and duodenum by this particular method, with a mortality of less than one per cent, and but three cases have required secondary operation upon the stomach for any cause.

In all "loop" operations, anterior and posterior, the intestine is applied to the stomach downward and to the right, but in the "no loop" method we found that this sometimes caused angulation as it turned the jejunum at the duodenojejunal juncture rather sharply from its normal position, and occasionally caused chronic bile regurgitation.

The vertical attachment of the jejunum to the stomach, as originally practiced by Mikulicz, with a transverse intestinal incision, and by Czerny with the Murphy button, has recently been revived by Mr. Moynihan, who is now using it with the longitudinal intestinal incision.[1]

Mortality in second period not greatly reduced, remaining at about 5 per cent, largely because a number of patients had complicated operations performed, and in some instances, several operations, which increased the mortality.

Third period covers about three years. A living pathology has been established and doubtful cases eliminated.

Gastrojejunostomy is still the most valuable operation. Excision, the Finney operation, and the operation of Rodman, each have a field in suitable cases.

The mortality of even the more complicated operations does not at this time exceed 3 per cent.

Three hundred and seventy-nine patients with gastric and duodenal ulcer were operated upon by us previous to June 1, 1906, covering a period of from two to fifteen years since operation. In 64 of these, no ulcer was actually demonstrated at the time of operation. In 11 secondary operations from this group, ulcers which had been previously overlooked were found in two cases, leaving 62 in which the actual presence of ulcer was not demonstrated. Fifty of these questionable cases were traced and the statistics show 34 per cent cured, 28 per cent improved, 17, or 34 per cent, unimproved, 6 per cent deceased. Combined percentage of cured and improved 62 per cent.

In the 318 cases of actually demonstrated ulcers,

[1] Annals of Surgery, 1908.

80.7 per cent were cured, 9 per cent improved, and 4.2 per cent unimproved. Six per cent have died since the operation from various causes, in only two cases, however, was the cause of death connected with the stomach, showing a total percentage of 89.7 per cent cured and improved.

After operation for ulcer, patients require careful medical supervision until they have made a complete recovery.

END RESULTS FOLLOWING OPERATION FOR BENIGN DISEASES OF THE STOMACH AND DUODENUM.

John B. Deaver, M. D. Stomach surgery is in its infancy. It has grown old enough, however, and has shown sufficient accomplishments, to make most investigators agree that certain pathological conditions to be found in that organ and the duodenum must be overcome by the surgeon rather than by the internist. The immediate results speak volumes; the end results are far superior to any that can be obtained by other than operative means.

Principal benign diseases of the stomach and duodenum found in the realm of surgery to-day are: Ulcer with its various complications; gastrectasis, whether due to pylorospasm, gastric myasthenia, or pyloric stenosis; and stenosis of the pylorus, with or without dilatation.

In gastric dilatation, gastric myasthenia, and ptosis of the stomach, probably the most that surgery can do is to alter the mechanism of the stomach and intestine that medical measures will become effective.

In pyloric obstruction, from any cause, a definite procedure is indicated, namely, the establishment of a free and permanent communication between the stomach and intestine.

In these various diseases, practical experience has taught that best results may be obtained by performing a gastroenterostomy. The choice of operation varies with different operators. Personally, I prefer the posterior gastrojejunostomy, when it is practicable, the no-loop-clamp method with excision of a portion of the mucous membrane, eliminating the danger of the so-called "vicious circle," the use of the clamps minimizing the danger of leakage and infection during the operation. The end results are quite as good with the suture method with no loop, but the primary danger is greater. The no-loop operation is a great advantage over the long loop. The immediate results are better and there is practically no danger of a vicious circle being established even subsequently. The operation of election should always be performed when possible; when not possible, the best procedure under the conditions present must be adopted. Anterior gastrojejunostomy, a poorer and much less satisfactory method, should not be excluded entirely from the surgeon's list of procedures. End results will probably always be better when it is possible to perform the operation of election or choice; but relief in all instances must be afforded the patient, if it be at all possible, whether the method used be one of choice or one of necessity.

I have been able to trace 66 of the patients upon whom I have performed stomach operations for benign disease. Of this number, 44 are free from all gastric symptoms, 9 are greatly improved, 5 are unimproved, and 8 have died. Percentage of cures 66.6; patients greatly improved, 80.3.

The cases traced were diagnosed as follows: Ulcer of the stomach, 37 cases; ulcer of the duodenum, 12 cases; stenosis of the pylorus, 8 cases; gastrectasis, 6 cases; vicious circle, 1 case; peripyloric adhesions, 1 case; neoplasm of pylorus, 1 case. Total 66 cases.

From an analysis of the list of diseases, operations performed, and the end results, I would draw the following conclusions, these naturally being influenced by the immediate dangers from the various forms of operation:

1. The operation of choice should always be performed when feasible; when not feasible, the operation of necessity should be performed.

2. All cases of stenosis of the pylorus, whether due to a neoplasm, cicatricial contraction, hyperplasia, pylorospasm, or what not, should be treated by operative interference, preferably by posterior gastrojejunostomy.

3. All cases of ulcer of the stomach which do not respond to medical treatment promptly, and the various sequelæ of this disease should be treated by operation.

4. All cases of ulcer of the duodenum, which do not respond promptly to medical treatment, should be treated by operation.

5. My preference in performing gastroenterostomy is by the posterior gastrojejunostomy, no-loop, clamp route.

HOW FREQUENTLY DO GASTRIC ULCERS BECOME CARCINOMATA?

For paper by Dr. William L. Rodman, see page 957.

GASTRIC AND DUODENAL ULCERS SECONDARY TO WOUNDS OF THE URINARY BLADDER

John B. Roberts, M. D. Mention was made of a case of death from perforating gastric ulcer after suprapubic lithotomy which Dr. Roberts had reported in 1887. A few years ago he lost a patient

from massive hæmorrhage, due to ulcer of the duodenum occurring in a man who had suffered extraperitoneal rupture of the urinary bladder and other injuries. These cases led to a search of literature for similar occurrences. There is a probability of the gastric and duodenal ulcerations being pathological sequences of the bladder lesion. This would be similar to that which occurs when a duodenal ulcer arises as a complication of burning or freezing large surfaces of the human body.

Dr. Roberts collected from literature and his own experience 16 instances of gastrointestinal bleeding subsequent to operative or other lesions of the urinary organs. The result was death in 14 cases, recovery in 2. There were operations for:

Cystotomy, 5
Litholapaxy, 1
Nephrotomy, 3
Extravasation of urine, 2
Nephrorrhaphy, 2

There were of non-operative cases:

Pericystic abscess, etc., 1
Perinephric abscess, etc., 1
Perineal abscess, etc., 1

making a total of 16. In 7 of the 10 fatal cases, ulceration was found at autopsy. In several of the remaining cases no necropsy was made, and the question of the presence of ulcer of the stomach or intestines, therefore, remains undetermined.

Abstracts were given of three cases of lithotomy, one of litholapaxy, and two of lumbar nephrotomy found in surgical literature which terminated in death after attacks of gastrointestinal hæmorrhage, with or without ulceration.

Mention was made of the fact that Curling in his classic paper published 64 years ago on duodenal ulcers secondary to burns, stated that he had seen similar ulcers in other surgical conditions than burns. Dr. Roberts quoted from papers published recently to show that a connection between abdominal and pelvic operations and post-operaive hæmatemesis and intestinal bleeding occurred sufficiently often to suggest a pathological connection. Most of the papers bearing upon this topic have been written within the last ten years.

The etiology of the gastrointestinal lesions under consideration is obscure but is probably connected with the occurrence of thrombosis and embolism due to septicæmia or toxæmia. Cases were mentioned of such hæmorrhage and ulceration occurring after operative procedures on regions distant from the abdomen and pelvis. Fracture, excision of the Gasserian ganglion, amputation of the thigh, removal of neuromatous tumor, excision of malignant disease of the palate and tonsils, and other surgical traumatisms followed by hæmatemesis or bleeding from the bowel, have been reported a few times. These cases apparently prove that the post-operative bleeding and ulceration of the gastrointestinal tract are caused by some more general pathological influence than local interference with the abdominal and pelvic circulation alone. Experimental and clinical evidence of such hæmorrhage and ulceration occurring through infection with the pneumococcus, the diphtheria bacillus, the colon bacillus, a staphylococcus, and from uræmic conditions, give credence to the theory that changes in the gastric and intestinal mucosa leading to fatal issue may be the result of several local influences or of a widespread pathological alteration in the cells and fluids of the body.

Nearly all the papers on this topic have discussed the questions from the idea that the operations causing the secondary phenomena under discussion must in some direct way involve the portal circulation. Although such lesions are probably more apt to occur after interference with the pelvic and abdominal organs, which are connected with the portal circulation, enough cases are on record to lead to a belief that a general condition, such as uræmic intoxication, atheroma of the vessels, toxæmia, infection, are instrumental in rendering the patient liable to the serious complication discussed.

Investigation has been made by a number of experimenters upon the production of gastric and duodenal ulcers by interference with the nervous connections of the gastrointestinal tract. Hort, of Torquay, makes the suggestion that some forms of gastric and duodenal ulcers may be only local expressions of a general blood disease not heretofore recognized. His paper states that the occurrence of gastric ulcer depends upon a breakdown of the normal immunity of the gastric mucosa against auto-digestion, through destruction of the anti-peptic bodies caused by thrombosis, embolism, necrosis, or other processes.

The serious prognosis in cases of post-operative hæmatemesis or bloody stools was insisted upon.

CONGENITAL STENOSIS OF THE PYLORUS

For paper by Dr. Frank Bunts, Cleveland, Ohio, see p. 663.

Dr. Willy Meyer, of New York, spoke of the complications following operations for stenosis of the pylorus and of the possible overcoming of these. A patient under his care had passed on the third day of convalescence into a deep coma, passing the stools and urine in the bed. Temperature and pulse showed no reason for the condition. The patient was given regularly every eight hours a

hypodermoclysis of salines. On the fifteenth day, he regained consciousness and went on to proper convalescence. In the secondary operation he prefers gastroenterostomy plus enterostomy to the short loop.

Dr. John H. Gibbon asked the experience of the Fellows as to the occurrence of peptic ulcer of the jejunum as a sequel to gastroenterostomy. In the absence of its mention in a report of over a thousand cases it would seem to be unusual.

Dr. George W. Crile, of Cleveland, referred to an unsurgical case rendered surgical by direct transfusion of blood at the time of operation. Although the hæmolytic test of cancer is still in the tentative stage, of 66 cases 80 per cent gave positive reaction to the test. This was confirmed by autopsy or by operation.

Dr. J. M. T. Finney has employed pyloroplasty for pyloric obstruction 48 times since 1903. Of these cases four have died. Autopsy showed the cause of death to be other than the operation. From the observations concerning gartroenterostomy, it would seem unreasonable to anticipate untoward results that have not yet manifested themselves. He regards the personal equation a determining factor in the choice of operations. Personally, he gets better results with pyloroplasty. Except in a few nervous cases, his results have been perfectly satisfactory. He endorses Dr. Rodman's dictum of resection in doubtful cases of ulcer. In inflammatory pyloric stenosis he believes pyloroplasty definitely contraindicated, and that gastroenterostomy should be employed.

Dr. John C. Munro, of Boston, said that an analysis some years ago of their hospital cases showed that less than 20 per cent of operated gastric ulcer cases had been failures. All of the cases were grouped under the long loop, double loop, and short loop. Some of the results could be definitely traced to the difference in technique. Since that time, the Finney operation had been employed almost exclusively.

Dr. Charles L. Gibson, of New York, asked whether the operations reduced the total acidity of the stomach contents.

Dr. John C. Oliver, of Cincinnati, has seen within the past two years four cases of congenital stenosis operated upon by gastroenterostomy. Two were his own cases; two those of his colleagues. In one of the cases (a female infant), the symptoms appeared at two weeks of age. There was a distinct family history of stomach trouble for three generations. The mother of this child during her pregnancy developed tuberculosis of the glands at the back of the neck. The mesenteric gland of the child showed an early stage of tuberculosis.

Dr. Francis J. Shepherd, of Montreal, did a pyloroplasty upon a child three weeks of age. The child is now 18 months old and in perfect health.

Dr. Leonard Freeman, of Denver, spoke of his satisfactory employment of linen thread for the hæmostatic suture in from 50 to 55 gastroenterostomies and related an experience emphasizing the necessity of from time to time examining the character of the catgut employed.

Dr. Willy Meyer, of New York, warned against making the loop too long.

Dr. John E. Summers, Jr., of Omaha, inclines to the belief that trauma is the cause of post-operative gastric and intestinal hæmorrhage.

Mr. B. G. A. Moynihan does the posterior, no loop operation, making the anastomosis as close as possible to the beginning of the jejunum. He regards the point of importance to be not so much the direction of the jejunum as its application to the stomach in such a way that it lies easily. With mimicry so close that it is difficult to distinguish between ulcer and carcinoma, the ulcer should be excised. He appreciates the difficulty of its excision when it lies up on the lesser curvature. He attributes post-operative regurgitant vomiting of bile to a mechanical defect at operation.

He has had one case of peptic ulcer subsequent to posterior gastroenterostomy. He has collected and will publish a report of 60 cases of peptic jejunal ulcer following gastroenterostomy.

Dr. W. J. Mayo, in closing, referred to the fact brought out that there could be secured not less than 80 per cent of permanent recoveries in gastric ulcers in which medical treatment had failed and that something less than 10 per cent more will be improved. The real difficulty in cases reported to be worse because of gastroenterostomies, he thinks, lies in the fact that the medical diagnosis has not been confirmed at the operating table; and, because the operation has been done upon cases in which it should not have been done, the internist assumes the position that the cases are worse as the result of the operation. They have done the Rodman operation over twenty times. Rather than ask the medical man to turn over to him early, cases of gastric ulcer, the surgeon should ask that he turn over cases of tumor the character of which he is waiting to determine. In these cases the surgeon can do better than the medical man, if they are not malignant. If they are malignant, it will put into the surgeon's hands a considerable number of malignant cases in time to cure them.

Dr. William L. Rodman dissents from the belief of Dr. Summers that post-operative hæmatemesis is due to trauma. His belief is based upon observations made upon dogs and inquiries of

colleagues. He thinks the most rational explanation is that suggested by Dr. Roberts, that it is due to sepsis. He has used Pagenstecher's suture for the inner stitch, but following a gastroenterostomy, in one case there was furious hæmorrhage. Copious vomiting occurred, and in one large vomited clot there was the Pagenstecher suture. He questions, therefore, whether it is well to use a Pagenstecher suture or a well-chromicized gut. He appreciates the possibility that the suture might have taken a downward course and caused trouble with the bowel.

STONE TUBERCULOSIS OF THE KIDNEY AND PERINEPHRIC ABSCESS

Paper by GEORGE SULLY VAUGHAN, M. D., Washington, D. C. See p. 692.

LARGE KIDNEY-STONE

Dr. David Barrow exhibited a large kidney-stone which weighed one pound and two drachms. An analysis by Dr. Heitzmann, of New York, proved it to be phosphatic. He had been unable to find but one stone larger, that one weighing 570 gms. The stone was removed from a man 48 years old, who had suffered for forty years, having had the first symptoms, those of some abdominal trouble, when 8 years of age. During boyhood, he averaged three or four attacks a year of pain, which he described as being intense in the region of the left kidney. When about 14, he was supposed to have had chills and fever, but was not relieved by quinine and suffered for a year. At the age of 20, urinary symptoms appeared, often voiding the urine as often as every half hour. The urination was painful and the urine in appearance muddy. For ten years, the symptoms remained about the same. He was a farmer, but was unable to do but little work without causing a return of the pain. At the age of thirty, the attacks were more frequent, often recurring in a month, and there was more abdominal soreness, and the urinary disturbance more constant. At the age of 38, noticed an enlargement about the size of an orange in the left abdominal cavity, which was sensitive to manipulation. For ten years after he lost ground, suffered more pain, had more evidence of sepsis, and the tumor increased in size slowly. For four years was practically invalided, unable to do any work, and was confined much of the time to bed. When first seen the following observations were made:

He was 5 ft. 8 in. tall, weighed 120 pounds, his expression was anxious, and complexion sallow, and there was every appearance of long suffering and ill health. In the region of the left kidney was a tumor about the size of a cocoanut. It was fixed and not affected by respiration. The urine was normal in quantity, alkaline, and contained a large amount of pus and phosphatic debris. No symptoms referrable to the right kidney. On December 16, 1905, at St. Joseph's Hospital, he was operated upon. An oblique incision was made from near the twelfth rib along the outer border of the erector spinæ muscle, curving forward a little above the crest of the ilium and Poupart's ligament. The tumor was enucleated which consisted of the kidney with a stone in its pelvis. The pedicle was transfixed and doubly ligated with silk, the ureter was traced for about three inches, and ligated with chromic catgut. The patient was not shocked, and left the table in good condition. Convalescence was satisfactory, and he left the hospital apparently well. At this time, now more than two years, he weighs 152 pounds, seems perfectly well and works every day on the farm.

RESULTS OF OPERATION ON THE KIDNEY FOR CALCULUS AND TUBERCULOSIS

For paper by DR. ANDREW J. MCCOSH, of New York, see p. 705.

THE DIAGNOSIS AND TREATMENT OF KIDNEY-STONE

For paper by DR. ARTHUR DEAN BEVAN, Chicago, see p. 675.

Dr. Leonard Freeman, of Denver, in operating for stone in the kidney prefers to cut through the parenchyma of the kidney. He finds that bleeding is easily controlled by grasping the vessels with gastroenterostomy forceps with the flexible blades covered with rubber. He exhibited an X-ray picture showing shadows resembling calculi in the ureter which were spoken of by Dr. Bevan as probably calcifications of the ligaments of the pelvis. Dr. Freeman thinks they might also be classified as calcified lymphatic glands, or phleboliths. An another X-ray picture revealed a cured tuberculosis of the bladder.

Dr. George E. Brewer, of New York, thought the paper of Dr. Bevan most timely, inasmuch as the modern text-books describe the diagnosis of kidney-stone in the same old words. As a matter of fact, there are no symptoms absolutely pathognomonic of stone in the kidney. Of all the signs and helps, he agrees with Dr. Bevan that the X-ray is the most important. An absolutely good plate, however, must be insisted upon. One source of error are the small points shown over the ureter. The majority of these shadows mistaken for stone, he thinks, are confined bodies. Another source of error was illustrated in a case of a man with history of renal trouble in which the X-ray showed

a shadow perfectly distinct over the region of the kidney, almost as large as an English walnut and with perfectly defined edges. This proved to be a kidney absolutely destroyed by tuberculosis.

Dr. Nathan Jacobson, of Syracuse, spoke of the value of the confirmatory test of the X-ray in cases of renal stone and showed a number of plates illustrating oxalate of lime, phosphate, and uric acid stones. He related a rare case in which treatment had been given by one of his confreres for cystitis. Dr. Jacobson operated and, upon doing a perineal section, a complete incrustation of the bladder wall was discovered. The child did well until anuria developed and death followed. Autopsy showed both kidneys absolutely filled with stone.

Dr. C. B. G. Nancrède, of Ann Arbor, warned against making a diagnosis of stone in the ureter or kidney by the X-ray alone, and described a case in which diagnosis based upon the X-ray was totally wrong. He asked Dr. Bevan whether, in the small percentages of failures to find the stone in the kidney or ureter by the X-ray, the composition of the stone was determined. He recently removed from the bladder quite a large stone which was entirely uric acid. He has never seen such a one in the kidney or ureter. Several X-rays showed not the slightest trace of the uric acid stone removed from the bladder.

Dr. Ellsworth Eliot, Jr., of New York, confirmed the statements concerning the probability of osseous development in the ligaments of the pelvis which are mistaken for calculi. He emphasized what had been said of the atypical character of the clinical features in cases of stone.

Dr. Joseph Ransohoff uses the X-ray only to confirm a diagnosis based upon a thorough clinical study. One symptom which he believes to be absolutely characteristic of stone in the kidney is persistent, continuous microscopic hæmaturia. An interesting point mentioned was that ureteral calculi sometimes produce no obstruction. Dr. Ransohoff has before shown a ureteral stone which was guttered, the groove allowing the urine to pass without difficulty. He has no difficulty in controlling hæmorrhage in nephrectomy with the fingers and dislikes the clamp because it prevents examination of the ureter. Whether or not the X-ray shows stone, he never regards an operation on the kidney complete without the passage of a catheter or probe along the whole length of the ureter.

Dr. Maurice H. Richardson has had encouraging results in his operations for stone in the kidney, yet differing in experience from Dr. Ransohoff, hæmorrhage causes him anxiety in the approach to the pelvis of the kidney through the kidney tissue. The question of diagnosis is to him the most interesting thing in surgery. Many times he has "taken the field" against a diagnosis of renal stone, and has been right. When, however, a man like Dr. Rodman makes a diagnosis of stone, he is inclined to agree. He has seen calcification of mesentery tumors twice or three times which he thinks could easily cause a mistaken diagnosis. He has known of the continuance of pain after removal of stone from the kidney, and has seen stone in the kidney fatal 22 years after removal of stone from the bladder, with no sign of pain during those years.

Dr. Willy Meyer believes that, after exhausting laboratory research, the X-ray should be employed in diagnosis of stone. Cystoscopy and catheterization should then be employed. The carmine test is of value, unless obstruction is caused by the stone.

Dr. George W. Crile, of Cleveland, spoke of the value of direct transfusion of blood in a case of nephrectomy in which there had been hæmorrhage. Reference was also made to a large, curved clamp devised by a colleague. It is useful in the control of hæmorrhage and is made on the principle of the clamp used for temporarily closing the carotid artery.

Dr. J. M. T. Finney agrees with Dr. Richardson upon the importance of diagnosis. Every unnecessary surgical operation is a reproach to surgery. In the words of a former Fellow of the Association, "Nine men out of ten know *what* to do, but the tenth man knows what not to do."

Dr. M. L. Harris, of Chicago, has operated three times in bilateral tuberculosis of the kidneys with successful results.

Dr. Francis J. Shepherd does not agree that hæmorrhage is easily controlled. In a recent case the hæmorrhage was so severe that it was necessary to remove the kidney.

Dr. John C. Oliver, of Cincinnati, presented an oxalic acid stone which he had supposed was the largest one ever removed. That Dr. Barrow had removed a larger one was not surprising, however, no matter what they did in Ohio, it was usual to find that they did a little better in Kentucky.

Dr. Lewis L. McArthur, of Chicago, thought it a tribute to the foresight of Dr. Senn in that, when the first exhibition of the X-ray was made in Chicago and he, as the Nestor of the profession there, was called upon to express his opinion of it, said, "I see the advent of this wonder with chagrin and anxiety, lest the student, finding a short route to diagnosis, will rely entirely upon this means and forget, or neglect, the means which already

are at hand." Dr. McArthur referred to a case in which clinical and laboratory evidence pointed to stone in the kidney but in which the X-ray failed to give the shadow. Operation was thus delayed for six months until the patient was insistent, and at operation twenty stones were found in one kidney.

THE DIAGNOSIS AND PROGNOSIS OF TUBERCULOUS AND SEPTIC CONDITIONS OF THE KIDNEY

G. E. Armstrong, M. D. Surgeons are interested only in unilateral, and primary renal tuberculosis. The infection is hæmatogenous and almost invariably descending. Tubercle bacilli do not often go against the stream in lymph or blood-vessels, and ascending infection is possible only when a stricture of the ureter obtains or when there is a reversed peristalsis. Is it probable that the infection of the second kidney, even in the presence of tuberculous cystitis, is descending and hæmatogenous.

Cystoscopic examination of the bladder, catheterization of the ureters, and the examination of the separate urines favor an early and accurate diagnosis and protect against error.

The frequency with which the urine from the diseased kidney is found neutral or alkaline in reaction is evidence of the early incidence of mixed infection.

To establish a diagnosis, tubercle bacilli and pus must be found present in the urine.

In early cases one finds commonly few bacilli and comparatively little pus. In late cases the pus may be quite free from tubercle bacilli.

The early symptoms often suggest stone. The functional value is sometimes lessened beyond all proportion to the organic changes in the kidney. Hæmaturia also may be considerable, and persistent and even serious, while the changes in the kidney are slight and limited in extent.

The efficiency of the other kidney can generally be correctly estimated by the specific gravity, freezing-point, and percentage of urea, but these tests are really only of comparative value.

The disease of the ureter is an ascending lesion secondary to the ulcer about its vesical opening and the infection is carried up along the lymphatics in its walls.

Fever is generally present in cases which present vesical ulceration and disappears after nephrectomy, being therefore apparently due to absorption of the septic urine by the ulcerated surface.

Nephrectomy is the safe and conservative method of treatment. Partial nephrectomy is unsatisfactory and disappointing. Nephrotomy should be reserved as a palliative measure in selected cases when no secreting renal tissue can be spared.

The recovery from operation is satisfactory. Wonderfully little disturbance of urinary secretion follows. The pain and frequency of micturition are greatly relieved and quickly. Complete relief depends, however, largely upon the condition of the bladder at the time of operation and the patient's recuperative power.

The results obtained in renal tuberculosis are improving. Schmieden collected 201 cases of nephrectomy after renal tuberculosis; of these 142, or 71 per cent recovered, and 59 or 29 per cent died. During the last ten years the mortality has not been more than 24 per cent. Israel reports 29 nephrectomies; of these 14 were primary with sound bladders; 11 recovered perfectly. Küster had 11 permanent recoveries in 17 cases of nephrectomy, Schede 16 in 22 cases and Czerny 11 in 25 cases.

ACUTE UNILATERAL HÆMATOGENOUS INFECTIONS OF THE KIDNEY

For paper by Dr. George Emerson Brewer, of New York, see p. 699.

DISCUSSION OF PAPERS OF DRS. ARMSTRONG AND BREWER AND CLOSING REMARKS OF DR. BEVAN

Dr. Emmet Rixford, of San Francisco, reported an operation for stone in the bladder in which autopsy revealed four ureters, in three of which were stones. In another case operated for subacute peritonitis, a small kidney was found in the vicinity of the vermiform appendix. The right kidney was hypertrophied. Regarding the cure of double tuberculosis, following removal of one kidney, he suggests an explanation in the production of hyperæmia by the blood being forced into the kidney somewhat after the Bier method in the cure of tuberculosis of the extremities. If this is true, it would seem not impossible to secure healing of small foci in tuberculous kidneys by other means than nephrectomy. Tuberculin may have a future in that direction.

Dr. A. G. Gerster, of New York, offered an explanation of the hæmorrhage in nephrectomy occurring nine or ten days subsequent to operation by the assumption of injury to a large arterial branch, causing thrombosis and that on the tenth day, the thrombosis becoming detached, the hæmorrhage took place. In two cases he has been obliged to remove the kindey after simple exploratory incision in the pelvis because of uncontrollable hæmorrhage. In one case it was shown that one of the larger branches of the artery had been divided half way. He has since entirely abandoned

the use of the knife in opening into the pelvis through the kidney and uses the following method: After incision of the cortical substance, the knife is laid aside. With a curved director he pushes forward into the pelvis of the kidney. Along this he passes a dressings forceps into the pelvis. This instrument is opened and then withdrawn. The finger is inserted along the track which has thus been made by tearing and stretching.

Dr. Frederick Kammerer, of New York, reported three cases of unilateral infection of the kidney. In the first case recovery followed the removal of one kidney. In the second case, showing but two infarcts in one kidney and the other being normal, the incised kidney was tamponed and replaced. Barring a severe hæmorrhage, the patient did well at first, but the ascent of temperature indicates the necessity of extirpation of the kidney. The third case was one of perinephritic abscess in which removal of the kidney was finally necessary. The urine after nephrectomy was normal as was the temperature, seeming to prove the point made in Dr. Brewer's paper that the infection can be unilateral.

Dr. John H. Gibbon, of Philadelphia, spoke of the X-ray plates as a most valuable means of diagnosticating ureteral calculi. Also important is the presence of microscopic blood. He pointed out the danger of the use of metal ureteral bougies. He referred to his previously published account of two cases of ureteral stone in which he did a combined extra- and intra-peritoneal operation. The two great advantages of the method were the time saved and the less possible traumatism. While the ureters should be drained after removal of stone, there is little difference whether or not they are sutured.

Dr. Charles L. Gibson reported a case with features similar to those described by Dr. Brewer with pain in the left kidney. Minute miliary deposits were seen at each pole. Half of the kidney at each pole was removed and the woman perfectly recovered.

Dr. George Woolsey, of New York, does not feel that a negative plate, even if considered perfect and taken by an expert, is at all a sure sign of no ureteral stone. He has operated upon two cases in which he found the lesion spoken of by Dr. Brewer and has obtained cure by nephrectomy. He feels that to Dr. Brewer is due a debt of gratitude for his presentation of a new field of pathology and treatment in kidney lesions.

Dr. Bevan, in closing the discussion of his paper, emphasized the importance of diagnosis in this order: The gross clinical picture, including history; careful ordinary examination of the urine, chemical and microscopical; X-ray examination. He finds in the teaching of student great difficulty in overcoming the "laboratory habit," and in impressing upon them the importance of the gross clinical picture. While he does not regard the X-ray infallible in the diagnosis of kidney-stone, he believes it can be relied upon in nine-tenths of cases. Diagnosis is arrived at by exclusion and then should be confirmed by the X-ray. He relies greatly upon the amount of urea. He believes that a great many of the cases can be operated upon under nitrous oxide gas, which he considers much safer than ether or chloroform.

Dr. M. L. Harris, of Chicago, said that in the use of the segregator in removing urine from two kidneys, if the urine dropped from the two sides synchronously, whether or not the amount is the same, it is always an indication that there has been an improper adjustment of the instrument or that an anomaly is present.

REPORT OF A CASE OF STONE IN THE BLADDER.

Dr. A. T. Bristow, of Brooklyn, N. Y., reported a case of stone in the bladder, associated with intermittent pneumaturia for three years, and the subsequent formation of a fæcal fistula.

Pneumaturia relatively common, though little mentioned in text-books. Over 200 cases reported in literature. Of two varieties:

1. Cases occurring within the urinary tract itself, and due to infection, either in kidney or bladder. When in the latter, usually occurs in diabetics. Method of distinguishing between the two types, by cytoscope, or chemical analysis.

2. Cases of pneumaturia due to fistulous communication between urinary tract and bowel: (*a*) Between renal pelvis and bowel; (*b*) Ureter and bowel; (*c*) Bladder and bowel. All the reported cases have occurred between bladder and bowel, as follows: bladder and cæcum; bladder and appendix; bladder and rectum. Causes: (*a*) Inflammatory, from appendicitis, with adhesion of the appendix or cæcum to the bladder and subsequent perforation, or, in women, from pelvic inflammation and adhesion between bowel and bladder; (*b*) Carcinoma involving bowel and bladder, usually secondary to uterine or rectal carcinoma. Has occurred in carcinoma of prostrate. Author's case: Supposed attack of renal colic, with reflex abdominal symptoms; distension, vomiting, fever, nine years ago. Recovery. No renal calculus passed per urethram. An interval of four years without symptoms. Then bleeding at the close of urination, with passage of gas either in bubbles or in large quantities. Calculus discovered in bladder. Suprapubic cystosomy. Recovery from

all symptoms. Eight months afterward pain, right iliac fossa, no fever, no spasm, return of pneumaturia, pus in urine. Subsidence of these symptoms in a few days. Patient then well for eleven months. Second attack following an afternoon of golf. Chill, fever, severe pain in right iliac fossa, extending to penis, followed by pneumaturia and return of blood and pus in urine. On a subsidence of symptoms which lasted about ten days, one month later cystoscoped and skiagraphed with stylet in left ureteral catheter. No stone in either ureter nor in kidney; shadow in left pelvis, which had been observed in previous skiagrams, shown to be an inch external to ureteral line. January following, 1906, another attack. May, 1906, another. January, 1907, another. All of brief duration and much the same character, and all followed by pneumaturia. Since the January, 1907, attack, pneumaturia has been constant, usually occurring in the morning. Fæces and bile have also been detected in the urine; also animal and vegetable fibers, and shad roe. There is now a definite fæcal fistula about an inch and a half above the right ureteral opening. While there is some pus and mucus in the bladder, there is no active cystitis, and, except for the occasional attacks before mentioned, the patient is perfectly well, so far as his general health is concerned, and refuses operation.

Dr. Frederick Kammerer reported a case of pelvic abscess which had healed promptly after opening, but cystitis developed. The cystoscope revealed a large, deep abscess to the right of the bladder in the mucous membrane. Some months later this abscess was operated upon and the appendix removed and the patient subsequently recovered.

Dr. Arthur D. Bevan, of Chicago, reported a case in which he had removed a kidney within the capsule, and in which was found a stone which had penetrated the duodenum. The man died of hæmorrhage of the lungs about the sixth day and there were found extensive septic infarcts of both lower lobes. Examination of the abdomen showed a perfectly clean peritoneal cavity, but posteriorly an opening into the duodenum which had been produced by the inflammation about the stone. Another case in which the X-ray showed an abnormally enlarged kidney, operation revealed the kidney and calices distended with gas.

Dr. George E. Brewer, of New York, suggested the possibility of some of these cases being diverticulitis.

Dr. Emmet Rixford, of San Francisco, reported the case of a man suffering from recurrent attacks of pelvic inflammation. In preparing for operation, castor oil was given which was followed by a furious peritonitis resulting in death. Autopsy showed a diverticulum. An abscess at the base of the bladder had opened both into the bladder and into the peritoneum.

Dr. George Woolsey, of New York City, reported the case of a patient who came to him for stricture of the urethra. Rectal examination showed a mass behind and to the left of the rectum. He suffered intermittent attacks of pain with rise of temperature and pneumaturia with pus and a little fæcal matter in the urine. An anterior incision was made, but the mass could not be reached. It was proposed to operate posteriorly but the man did not return. The anterior incision had enabled him to pass a catheter and so relieve the attacks of pain. It was suggested that this might be a cases of acute diverticulitis folowing the incision.

PRIMARY CARCINOMA OF THE FEMALE URETHRA

Dr. Lewis S. McMurtry, of Louisville, has made a diligent search of the literature of this subject in the Surgeon-General's office in Washington to the present time, and has added eleven cases to the list as recorded by Dr. J. S. Percy of Galesburg, Illinois. The entire list to date consists of twenty-seven cases. Dr. McMurtry reports two cases in which he has operated in the last three years. In both cases the disease originated in the urethra. Both were treated by complete excision of the urethra down to the sphincter muscle of the bladder. In one case there was recurrence during the first year, rapidly extending to the base of the bladder, the perivesical tissues, and inguinal glands. Further operation was not permitted. The second case the pathological process was in its incipiency; the urethra was excised as indicated; prompt healing followed with perfect control of the bladder, and there has been no recurrence one year after operation. The writer claims that early diagnosis of the condition is difficult because of the resemblance of the intial lesion to urethral caruncle. Attention is also called to the difficulty of differential diagnosis from certain syphilitic lesions which obtain in the same location. The prognosis and treatment are the same as for carcinoma in other parts of the body. The great desideratum for successful treatment is habitual examination of all cases applying to the physician with painful micturition, early diagnosis of malignant types of disease, with complete excision in that early stage of invasion when permanent cure is possible.

REPORT OF A CASE OF MELANOTIC SARCOMA

Dr. Francis J. Shepherd, of Montreal, reported a case of melanotic sarcoma of the common bile duct, and of the ampulla of Vater.

The case was that of a man aged 42 years who, in June, 1907, complained of severe itching over the body. He then became jaundiced, with loss of flesh and strength. A rounded, painless swelling was made out in the region of the gall-bladder. In July he entered the Montreal General Hospital for exploratory operation by Dr. Shepherd. The condition was thought to be due either to malignant disease or gall-stones. At the operation no obstruction of the bile duct could be made out, and no gall-stones were found, nor was there any appearance of malignancy. The gall-bladder was drained, but the patient died of asthenia six weeks after operation. The autopsy revealed a soft, brownish black fungoid mass 2.5 cm. in length, completely occluding the common duct, and part of Vater's diverticulum. This mass was so soft that it could not be made out by external manipulation of the duct, and a probe easily passed through the duct into the duodenum. The pancreas was not involved. The growth was apparently primary, for a most careful examination failed to reveal any melanotic growth elsewhere, nor were there any pigmented moles on the body. It is suggested that at some time or other some pigment cells got dislodged from a normal situation and subsequently were arrested in the bile duct.

Secondary melanosarcomata, are common in the liver, but no case has been reported of such a growth in the common bile duct.

PSYCHICAL END RESULTS IN MAJOR SURGICAL OPERATIONS

For paper by Dr. James G. Mumford, of Boston, see later number of Surgery, Gynecology and Obstetrics.

FURTHER EVIDENCE IN SUPPORT OF THE THEORY THAT HODGKIN'S DISEASE IS A TYPE OF SARCOMA

For paper by Dr. William B. Coley, of New York, see p. 649.

THE USE OF STERILE OIL TO PREVENT INTRAPERITONEAL ADHESIONS; A CLINICAL AND EXPERIMENTAL STUDY

For paper by Dr. John Bapst Blake, of Boston, see p. 667.

Dr. A. Vander Veer, of Albany, has used oil in the manner reported by Dr. Blake but in larger quantities, 4 to 6 ounces being used and the patients did well. He believes that the amount of peritoneal adhesions following abdominal operations is overestimated.

RHINOPLASTY FOR SUNKEN NOSE

For paper by Dr. John F. Binnie, of Kansas City, Mo., see p. 599.

Dr. John B. Roberts spoke of his interest in operations such as Dr. Binnie had done and referred to a similar case under his care of a young girl, in which he had taken two large tongue-shaped flaps from her rather fat cheeks.

Dr. Leonard Freeman, of Denver, spoke of two classes of saddle nose, one in which the skin is loose, and one in which there is considerable cicatricial tissue and tendency to contraction. Those of the former variety are satisfactorily treated by the use of paraffine, the latter by the employment of metal plates.

Dr. Emmet Rixford, of San Francisco, spoke of the availability of the tissue of the rib in these operations for sunken nose.

HÆMOLYTIC TESTS FOR MALIGNANCY

For paper by Dr. George Crile, of Cleveland, see later number of Surgery, Gynecology and Obstetrics.

SURGICAL ASPECTS OF GRAVES' DISEASE WITH REFERENCE TO THE PSYCHIC FACTOR

For paper by Dr. George Crile, of Cleveland, see later number of Surgery, Gynecology and Obstetrics.

PRIMARY CARCINOMA OF THE APPENDIX

Dr. Richard H. Harte, of Philadelphia, reviewed the subject of primary carcinoma of the appendix, which has been regarded by some as a surgical curiosity, but showed that probably a hundred cases could be collected from the literature. Apparently, the cases collected belong to two classes — the so-called basil or spheroidal cell type and the columnar cell type. The former occurs, in the majority of instances, in young subjects. The latter is found in older subjects and undoubtedly possesses a much greater degree of malignancy than the former. In an analysis of ninety odd cases it is found that the average age is about 29 years, that the majority of cases collected occur between the ages of 10 and 40 years, and that nearly all the cases are found as the result of operations for appendicitis. The writer does not think there are any signs pointing to cancer other than the classical signs of appendicitis, and that a diagnosis of cancer of the appendix prior to an operation is impossible. Such diagnosis can be positive only after the removal of the appendix and micro-

scopical examination. Pathologically, it would appear that all these cases of cancer are engrafted upon a chronically inflamed appendix. In many instances the neoplasm can be detected only by the microscope and it occurs in the mucosa and submucosa. Appendiceal tumors give rise to symptoms apart from those accompanying appendicitis only when the growth invades the cæcum and becomes a carcinoma of this organ. By this time the appendix has lost all its characteristics, and is hardly recognizable as a part of the primary growth. Dr. Harte is of the opinion that these cæcal cancers originating in the appendix are apt to occur between the ages of 40 and 60, and that they have a marked tendency to metastasis or recurrence. It would seem probable that the cases of primary malignancy of the appendix fall in two classes — the columnar type as found in the stomach and intestines and other parts of the alimentary tract, and the spheroidal or basil cell type which closely resembles the carcinoma of the skin. It is, therefore, fair to consider that the basil or spheroidal cell carcinoma of the appendix is a disease occurring in early adult life, is characterized by relatively slight malignancy, does not tend to metastasis or recurrence after operation. The columnar type appears later in life, presents the characteristics of the growth found in the stomach and intestines, etc., has a strong tendency to metastasis, with unfavorbale prognosis. Dr. Harte emphasizes the fact that the classical signs of appendicitis are of no value whatever in making a diagnosis — which can be made only after removal of the appendix. It is said that primary carcinoma of the appendix is present in from one-third of 1 per cent to 1 per cent of all cases operated upon for chronic appendicitis, and that but few cases are collected at autopsy. A much larger number would be found, were routine examination made at operations and autopsies. The disease appears to be slightly more frequent in females than in males. It is argued that, since primary carcinoma of the appendix takes its origin in an inflammatory process, all appendices showing evidence of any irritation should be removed.

CARCINOMA OF THE APPENDIX WITH METASTASES TO THE ILEOCOLIC GLANDS

Dr. Robert G. Le Conte, of Philadelphia, called attention to the fact that carcinoma of the appendix is usually discovered by the pathologist after the appendix has been removed and that when the disease is confined to the appendix, the removal of that organ is sufficient to bring about a cure. In some cases, however, the disease has extended to the cæcum. A case of this type is reported in which the primary growth had spread to the cæcum and presented metastases to the ileocolic glands. The patient was a white single woman, aged 21, who had suffered for ten years with repeated attacks of pain in the appendix region. In April, 1907, the appendix was removed and it was found to be invaginated into the head of the cæcum with but an inch extending beyond the cæcal border. Microscopical examination showed that the entire appendix was the seat of carcinoma and that the tumor growth had extended into the cæcum. Six weeks after the first operation, the cæcum with a portion of the ileum was resected with the entire group of ileocolic glands. At the present time the patient is apparently perfectly well. Two explanations of the sequence of events in the appendix are suggested.

ŒDEMA OF THE LARGE INTESTINE WITH LOCALIZED NECROSIS OF ITS WALL, FOLLOWING SPLENECTOMY IN BANTI'S DISEASE

Dr. John E. Summers, Jr., of Omaha, in this paper reported a case which followed closely Senator's definition of Banti's disease, namely: "Splenic anæmia with ascites, without local evidence of a general and otherwise positive tuberculosis." Urobilin was not found in the urine. While this is important when positive, it does not negative the diagnosis of Banti's disease. Dr. Summers did a splenectomy on February 28, 1907. A few days later, upon the development of apparently classical symptoms of acute perforative appendicitis, the abdomen was opened. Instead of an appendicitis, there was present a large amount of bad-smelling turbulent fluid. The sigmoid flexure was displaced to the right, fixed, and œdematous. On its right mesenteric border there was a perforation and two sphacelated spots distally. The necrotic line was folded in as well as possible, by means of a double button-hole stitch, and an omental flap was tacked over the area involved. The cæcum and its appendage were also œdematous as was the rectum. After thorough irrigation, the lower peritoneal cavity was sponged as dry as possible and local and pelvic tubular drainage established and the man placed in Fowler's position. To-day the man is able to walk down town and is gaining weight. Occasionally, there is a discharge from a knitting-needle sized fistula, but it has not been deemed prudent to operate. In addition to tonics the man has taken extracts of spleen and bone marrow. Direct transfusion of blood was apparently of no particular benefit. Dr. Summers regards his case as somewhat analogous to to the case reported by Delatour in his paper entitled "Thrombosis of the Mesenteric Veins as

a Cause of Death after Splenectomy (Annals of Surgery, 1895)." The findings of the condition of the splenic blood-vessels in Dr. Summers' case, he thinks, proves conclusively that the post-operative thrombosis of the splenic vein can hardly be considered from another standpoint than due to the traumatism of splenectomy. Study of the literature fails to discover a single case of œdema with gangrene of the large intestine following splenectomy, and the author does not recall any reported case of gangrene of the large intestine the result of thrombosis of the superior mesenteric artery or vein.

EXPERIMENTS IN FLUSHING THE INTESTINAL CANAL WITH SALT SOLUTION THROUGH ENTEROTOMY OPENINGS

Dr. George H. Monks, the writer, described a series of studies which he had made on animals and human cadavers for the purpose of determining whether it is practicable to attempt to remove part of the intestinal contents by washing out the canal of the intestine through multiple enterotomy openings. The results of these experiments were such as to lead to the belief that, in certain desperate cases where the patient's life is threatened because of actue intestinal poisoning, and where simpler means have ben used in vain, a portion, at least, of the intestinal canal may with advantage be flushed with warm solution from one enterotomy opening to another one lower down in the bowel.

The writer referred to one desperate case — already reported — where this procedure had been successfully used.

CONGENITAL IDIOPATHIC DILATATION OF THE COLON (HIRSCHSPRUNG'S DISEASE)

For paper by Dr. J. M. T. Finney, of Baltimore, see p. 624.

DISCUSSION OF DR. FINNEY'S PAPER

Dr. Leonard Freeman, of Denver, reported the case of a young man presenting a pronounced type of Hirschsprung's disease. He had been troubled with constipation ever since he could remember, and as much as three months had elapsed without a movement of the bowels. The colon was enormously dilated below the splenic flexure. The surface of the large intestine was plicated and replicated and replicated again until it was reduced to something like normal size. It was impossible to make anastomosis or to resect the bowel. Enlargement of the mesentery was not noticed. The subsequent history of the case was reasonably good. Dr. Freeman would not ordinarily consider this operation of plication a good one for the ordinary case, but in the present case it answered the purpose.

PELVIC ABSCESS WITH SPECIAL REFERENCE TO RECTAL DRAINAGE

For paper by Dr. Archibald MacLaren, of St. Paul, see p. 671.

Dr. Ellsworth Eliot, Jr., of New York, has seen a number of cases in which the opening for drainage of abscess cavity was established between the abscess cavity and the large intestine, and in most cases the result has been satisfactory regarding drainage and closure. In cases where Nature has made the opening, though drainage has been satisfactory in some, in a considerable number subsequent operation through the abdomen has been necessary. His larger experience has been with the suprapublic drainage and his results have been invariably satisfactory, not only with abscesses from diseased tubes but with abscesses of the appendix.

Dr. Stanley Stillman, of San Francisco, believes that an accumulation of pus shut off by coils of intestine should be drained through the rectum.

Dr. Richard H. Harte, of Philadelphia, reported a case of man desperately ill. Diagnosis was impossible, except that there was a pelvic collection and pain referred to the left side which was thought might be a prostatic abscess. A speculum in the rectum reached a large abscess from which was drained almost a quart of pus. Recovery followed. While the method partakes of blind surgery and should not be followed invariably, in certain cases it is valuable.

Dr. MacLaren, in closing, thought fæcal fistula more likely to follow in cases in which the abscess opened itself because it opens at the top. If opened by the surgeon, drainage is perfect rendering fistula improbable. Although, as Dr. Harte says, the method may be blind surgery, it becomes less blind. If an accumulation of pus is felt through the vagina or rectum, there is no doubt of its presence. Dr. MacLaren has made it a rule in some of these cases never to allow a woman to die without making a vaginal section, and some remarkable results have followed. Another rule invariably followed in treating such cases in men is to put a tube in the rectum.

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GEORGE H. BALLERAY, M. D., Paterson. N. J., in a paper on "The Etiology, Pathology and Treatment of Fibroid Tumors of the Uterus," read at the 140th annual meeting of the Medical Society of New Jersey.—*Journal of the Medical Society of N. J., Nov., 1906.*

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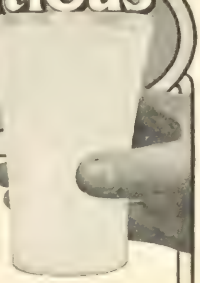

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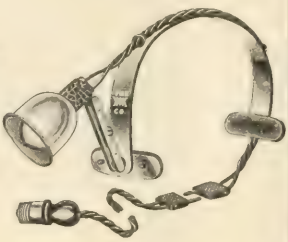

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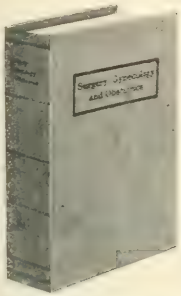

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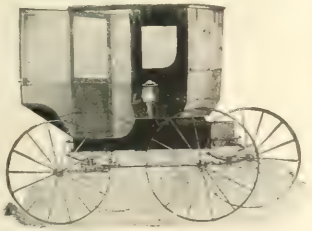

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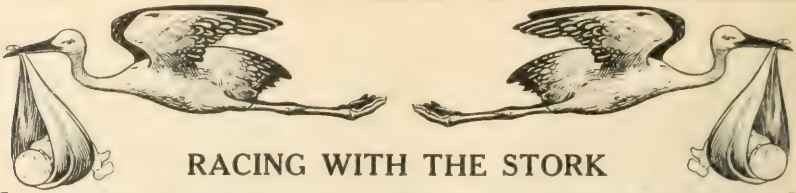

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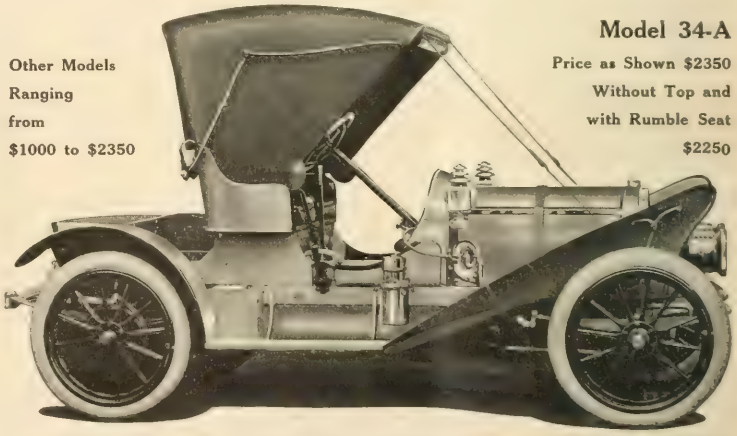

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